NETWORK WORLD
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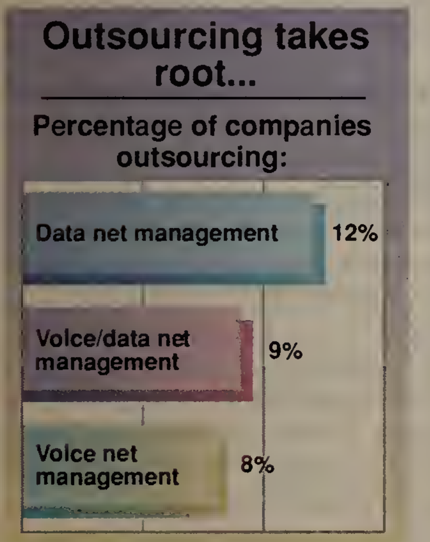
FEATURE

Survey: Drawing a bead on net managers' top concerns

Security a nettlesome problem; staff shortages continue; networking of Windows looms as issue.


Outsourcing takes root...
Percentage of companies outsourcing:

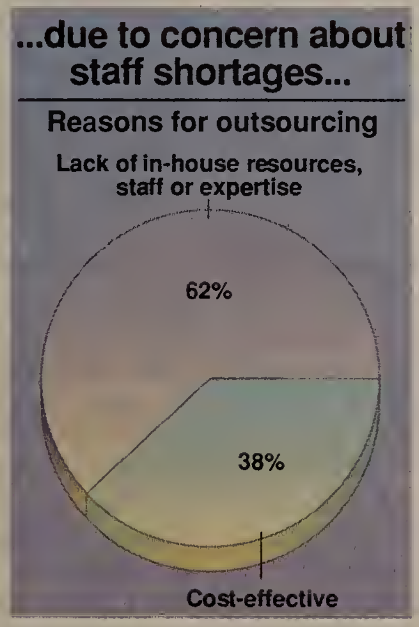
By Salvatore Salamone
Features Writer

Network managers face continuing challenges in dealing with vendors, coping with new technologies and finding skilled staff. They also must contend with increased threats to network security.

These were among the key concerns highlighted in *Network World's* latest Critical Issues Survey, which is based on in-depth telephone interviews with 100 network managers (see "An industry cross section," page 103).

The survey also examined network managers' technical responsibilities. For example, network managers were asked how they go about evaluating new technologies to deliver more and better network resources to users.

The survey also explored how network managers handle staff, deal with vendors and grapple with purchasing decisions for networking products and services.


...due to concern about staff shortages...
Reasons for outsourcing

An especially troubling area these days is network security. Network managers have long focused on enterprisewide security, but the growing trend toward open access to networks has exacerbated security problems during the past year ("Lock up your data," *NW*, May 13).

Managers indicated that viruses are the biggest security threat. Thirty-two percent of survey respondents said viruses attacked their nets last year.

Following viruses, corporations' own employees caused the greatest number of security problems. Nearly 20% of all those surveyed said data was damaged by unauthorized internal users. The next biggest security breach took the form of hackers, with 18% of respondents saying that hackers

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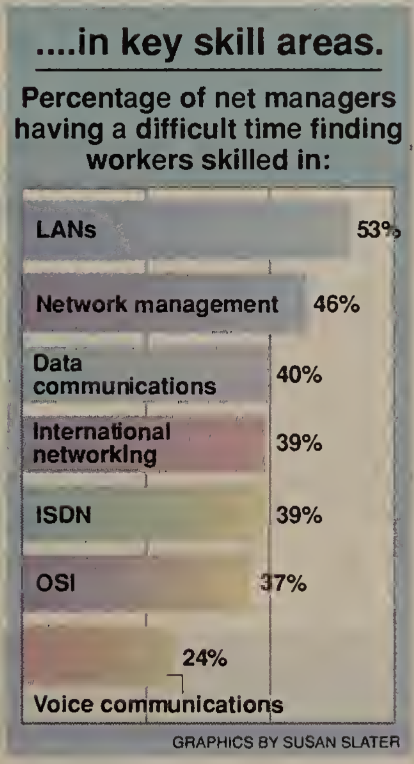
....in key skill areas.
Percentage of net managers having a difficult time finding workers skilled in:

GRAPHICS BY SUSAN SLATER

New DEC, HP routers ready for ICA debut

Companies to offer multiprotocol routers; DEC preps frame relay interface, FDDI, OSI products.

By Jim Brown
Senior Editor

ANAHEIM, Calif. — Digital Equipment Corp. and Hewlett-Packard Co. will unveil multiprotocol routers at the International Communications Association's 44th Annual Conference and Exposition here this week.

Sources briefed on the announcements said DEC will also introduce a frame relay interface for its new and existing routers and a bevy of other products, including Ethernet-to-Fiber Distributed Data Interface bridges and Open Systems Interconnection offerings ("DEC announces bridges," page 116).

The DEC routers will support the Integrated Intermediate System to Intermediate System (IS-IS) routing protocol, an emerging international standard that enables different vendors' routers to interoperate.

DEC's implementation will enable its router to forward OSI, Transmission Control Protocol/Internet Protocol and DECnet Phase IV packets.

DEC's new Network Integration Server (NIS) 600 is a high-end device based on a multiprocessor architecture supporting multiple Ethernet interfaces and 64K bit/sec and T-1 trunks. The device is expected to be beta-tested this fall and shipped next year.

The company will also intro-

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A week for product debuts

Among the announcements planned for this week:

- HP's Interconnect Manager for integrated systems and net management. Page 4.
- A new low-end mux and management tools from Newbridge Networks. Page 4.
- Ungermann-Bass 16M bit/sec token-ring LAN hub supporting as many as 255 nodes. Page 6.
- New international service locations from BT North America. Page 6.
- Support for integrated voice/fax traffic and new security features for MICOM's X.25 switches. Page 112.

IBM 3745 to get Ethernet, frame relay

By Paul Desmond
Senior Editor

WHITE PLAINS, N.Y. — IBM later this month is expected to announce major enhancements for its 3745 Communication Controller, including a frame relay interface and support for Ethernet local-area networks.

The interfaces are expected to be unveiled along with new models of the 3745 that boast added processing power and memory, although details about the new machines were not available.

Network Equipment Technologies, Inc. (NET) is also expected to be on hand to announce an integral packet processing card for its IDNX T-1 multiplexer, which IBM resells. The card will support frame relay and a multiprotocol routing capability based on Cisco Systems, Inc. software.

Users will have the option of

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NETLINE

SENATE SET TO VOTE on bill that allows RBHC equipment manufacturing. Page 4.

GSA ORDERS five federally operated utilities to migrate to FTS 2000. Page 4.

VA EXEC says improvements to agency's net a necessity, not a choice. Page 4.

AT&T TRIDOM ADDS VSAT router for sending TCP/IP data over satellite links. Page 6.

BUYER'S GUIDE looks at 140 bridges and routers. Page 51.

INNOVATORS AND GATORS: Neff champions Case Western's net, page 76; Baxter Healthcare wrestles modems, page 110.

NEWSPAPER

American Express drafts CCS7 plan with carriers

By Bob Wallace
Senior Editor

PHOENIX — American Express Travel Related Services Company, Inc. (TRS) said last week it has met with long-distance carriers to draft plans for establishing direct links into their signaling nets in order to improve management of the company's sprawling call center net.

Establishing the Common Channel Signaling System 7 (CCS7) links is a critical element in the company's plan to enable its nationwide automatic call distributor (ACD) network to take advantage of intelligence in the public network to route incoming calls.

That would help American Express TRS better handle peak traffic periods at its call centers, cut network costs by processing calls more quickly and provide clients with a higher level of customer service.

"We want the ability, on a call-by-call basis, to route calls while they remain in the public network," said Robert Hoss, vice-president of planning and engineering for American Express TRS' worldwide information processing and telecommunications group. "This would help us greatly in performing load balancing among our locations."

American Express TRS recent-

(continued on page 118)

Net/Master enhanced with support for LU 6.2 and SQL

New data mapping feature will also help advance the SNA mgmt. system's multivendor capabilities.

By Paul Desmond
Senior Editor

RESTON, Va. — Systems Center, Inc. last week announced a new release of its Net/Master SNA network management system that enhances the automation and multivendor management capabilities of the system by adding support for LU 6.2, SQL and a new data-mapping facility.

The features are intended to enhance the ability of Net/Master to gather and understand management data from multivendor devices. That, in turn, is expected to help Net/Master automate responses to problems by providing more information on which to make a decision, according to Dale Vecchio, director of marketing for Net/Master products at Systems Center, headquartered here.

David Passmore, a partner with Network Strategies Practice, a network consulting practice of Ernst & Young in Vienna, Va., agreed with Vecchio's assessment. "They're tying more things back into the Network Control Language so that you can develop more flexible applications to do further automation," he said.

Network Control Language (NCL) is the fourth-generation language Systems Center and customers use to write Net/Master applications. It has been en-

(continued on page 118)

Early users praise AT&T's virtual data network service

Say the service exceeds performance guarantees.

By Bob Wallace
Senior Editor

Early users of AT&T's Software-Defined Data Network (SDDN) said the service performs as well as or better than private lines and is more economical than leased lines for applications demanding less than four hours of daily connect time.

SDDN, announced at last year's International Communications Association conference, is best suited for such applications as local-area network interconnection, videoconferencing and disaster recovery, according to customers.

"I am extremely pleased with the performance of the service," said Vincent Russo, NCR Corp.'s worldwide network services director. "We've found that SDDN performance is equal to or better than private lines, and it's cheaper in instances where we have less than four hours a day of data transmission."

SDDN, the data equivalent of AT&T's virtual voice service, is offered as an option to the Software-Defined Network service and enables users to establish high-speed switched data links on demand.

SDDN is accessed using an Integrated Services Digital Network Primary Rate Interface (PRI) or AT&T Dataphone Digital Service,

(continued on page 114)

Brokerage firm counts on voice recognition for edge

By Barton Crockett
Senior Editor

NEW YORK — In what could be a crucial test for voice recognition technology, a start-up brokerage firm last week cut over a high-profile trading system that lets traders issue spoken commands to execute orders via computer.

EJV Brokerage, Inc. is using voice recognition technology to convert spoken words into data that is transmitted via a high-speed network to match buyers and sellers of government bonds. The project represents one of the biggest uses of voice recognition technology ever, both in the number of users and the importance of the application.

EJV Brokerage, based here, is a unit of EJV Partners, L.P., a joint venture formed last year by Citibank, N.A., The First Boston Corp., Goldman Sachs & Co., Morgan Stanley & Company, Inc., Salomon Brothers, Inc. and Shearson Lehman Brothers, Inc.

"If EJV does well, it's going to do a lot for voice [recognition]. If not, it will hurt the industry," said Michael Poser, first vice-president for advanced systems at the Lehman Brothers unit of

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Briefs

MCI to extend Vnet to Canada. MCI Communications Corp. last week announced plans to begin offering Vnet virtual net service to Canada in conjunction with Unitel Communications, Inc., which will link Vnet to its VRoute service. Beta tests of the service are scheduled for the summer, with commercial service to begin in the fall. Unitel has already announced plans to link its VRoute service with AT&T's and US Sprint Communications Co.'s international virtual net services. MCI currently only offers international Vnet to the U.K., but service to Australia, Belgium, France and the Netherlands is scheduled for later this year.

Bush to reappoint FCC's Quello. The White House last week said President Bush intends to reappoint FCC Commissioner James Quello to serve a five-year term beginning July 1, 1991. Quello, who was sworn in as a member of the Federal Communications Commission in April 1974, said he intends to remain with the commission.

US Sprint launches discount program. Following the lead of rival carriers, US Sprint Communications Co. last week rolled out a new discount program for small to midsize businesses. The deal, dubbed Dial 1 WATS Advantage, is targeted at firms that spend between $100 and $15,000 per month on outgoing voice calls. Users will receive increasingly large discounts as charges increase. For example, customers get a 2.5% discount for $1,000 in calls, a 7% discount for $3,000 in calls and as much as a 10.5% discount for $15,000 in calls.

AT&T signs 19th Tariff 15 deal. AT&T filed its 19th Tariff 15 deal last week for American Home Products Corp. The deal will give the company a 14% discount off the total monthly charges for Software-Defined Network (SDN) Service Expanded Volume Plan and a 2.5% discount off total outbound international SDN calls. AT&T said the offer was in response to a deal that US Sprint Communications Co. proposed to American Home Products. Although the plan is scheduled to take effect July 13, the Federal Communications Commission has held up all Tariff 15 deals for the maximum time allowable — now nine months — to investigate. Opponents question whether allowing AT&T to single out certain customers for discounts violates provisions of the Communications Act of 1934 forbidding discrimination.

Congress airs concerns to FCC. Legislators from the House Telecommunications Subcommittee last week fired off a letter to FCC Chairman Alfred Sikes expressing concern about several issues now pending before the Federal Communications Commission. The letter, signed by 14 members of the subcommittee, expressed uneasiness about the potential for widespread disruption to the long-distance marketplace if the FCC changes the access pricing rules, which expire in September ("Debate heats up over local access pricing," *NW*, April 22). The letter also asked the FCC to examine the possible market impact of the FCC's Tariff 12 decision and its rule making proceeding to loosen regulatory restrictions on AT&T.

Cisco, ANS team on router venture. Cisco Systems, Inc. and Advanced Network and Services, Inc. (ANS) this week are expected to sign an agreement to jointly develop next-generation router technology that will enable customers to use Cisco routers to access such advanced network services as frame relay and Switched Multimegabit Data Services on the National Science Foundation Network.

The vendors will also add support for the Internet Engineering Task Force's dual Intermediate System to Intermediate System protocol to Cisco's router line. ANS is a nonprofit venture of IBM, MCI Communications Corp. and Merritt, Inc.

AT&T, foreign carriers seal alliance. AT&T and three foreign carriers last week said they have finalized an alliance that will enable them to speed the design and installation of global networks for users. By specifying a common set of network designs, protocols and equipment that each carrier will support as part of a global network, AT&T, British Telecommunications PLC, France Telecom and Kokusai Denshin Denwa, Ltd. said they will be able to install some global nets 50% faster than before. The carriers also said they will now be able to respond faster and more effectively to network trouble reports.

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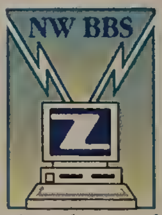

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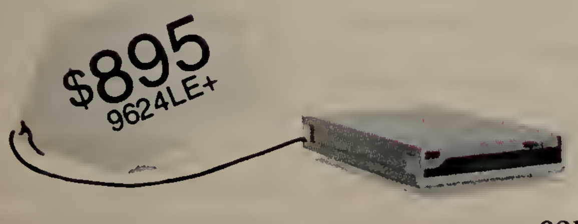

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Senate to vote on Hollings' RBHC manufacturing bill

If passed, bill would lift MFJ restrictions on RBHCs.

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — The Senate this week is scheduled to vote on a bill that, if passed, would permit the regional Bell holding companies to manufacture telecommunications equipment.

The Senate is expected to vote on S. 173, a bill introduced by Sen. Ernest Hollings (D-S.C.) earlier this year that would lift the manufacturing ban imposed on the RBHCs by the Modified Final Judgment at divestiture.

If enacted, the bill would allow the local carriers to research, design and fabricate telecommunications hardware and software.

Observers last week predicted that the bill would pass the full Senate. Although the legislation has provoked strident debate among lawmakers, Hollings managed to meld an increasingly supportive coalition for the measure. The bill goes to vote with 25 cosponsors.

Hollings has worked with numerous labor and consumer groups, as well as the RBHCs, to appease concerns and iron out a compromise. The senator, for example, included a provision in the bill that the RBHCs must manufacture 60% of their telecommunications components in the U.S. to protect domestic jobs.

The Senate vote culminates several years of intense lobbying by the RBHCs.

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The Senate vote culminates several years of intense lobbying by the RBHCs and would be the closest the carriers have come to winning greater market freedom. Last year, the Senate Commerce, Science and Transportation Committee passed a similar bill, but it was never taken up by the full Senate.

Late last week, it appeared that opposition forces were quickly fading after Sen. Howard Metzenbaum (D-Ohio), chairman of the Senate Antitrust, Monopolies and Business Rights Subcommittee, decided not to block the vote.

Instead, opponents will likely

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We want to hear from you.

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HP to introduce integrated TCP/IP net mgmt. product

Interconnect Manager offers net and system management for SNMP nodes on TCP/IP nets.

By Caryn Gillooly
Senior Editor

PALO ALTO, Calif. — Hewlett-Packard Co. this week will roll out the Interconnect Manager, a product that combines several existing net management products and provides integrated network and system management for Simple Network Management Protocol (SNMP)-based nodes on TCP/IP networks.

To be announced on Tuesday, in conjunction with the company's new router (see "Multiprotocol router debuts set by DEC, HP," page 1), the Interconnect Manager will be able to manage network devices such as hubs, bridges and routers attached to Transmission Control Protocol/Internet Protocol networks.

In addition, the product will enable administrators to manage systems attached to TCP/IP network devices — showing, for example, which applications are running and how much disk space a server might have available.

The Interconnect Manager is a Unix application based on the HP OpenView management architecture and geared toward customers with large, heavily interconnected networks, the firm said.

The new product bundles the company's existing Hub Manager, Bridge Manager and Router Manager — products used to manage HP's router, bridge, EtherTwist Ethernet hub and other DOS-based IP devices — as well as a new version of its Network Node Manager announced last week.

The Internetwork Manager is designed to be used as a central control for gathering information using SNMP. From the console, the administrator will be able to manage remote devices as if he was using a local system console.

"With the Internetwork Manager the administrator will be able to do software distribution, remote updates, node configuration and even access the local management console," said Magdy Assam, a product manager for network management at HP.

The Internetwork Management component that will gather the SNMP data is Release 2.0 of HP's OpenView Network Node

(continued on page 115)

Newbridge preps low-end mux, new control tools

By Paul Desmond
Senior Editor

ANAHEIM, Calif. — Newbridge Networks, Inc. is expected to announce this week a new low-end multiplexer as well as enhancements to its net management system that include support for SNMP and improved rerouting capabilities for its T-1 products.

At the International Communications Association's 44th Annual Conference and Exposition here, Newbridge will announce the 3606 MainStreet Little MUX, a voice/data networking multiplexer supporting a single 256K bit/sec wide-area trunk.

In addition, the company will unveil the 5638 MainStreet SNMP Manager, which is a software package that adds support for the Simple Network Management Protocol to Newbridge's 4602 MainStreet Intelligent Network-Station net management system.

About the size of a modem, Newbridge claims the 3606 MainStreet is the smallest voice/data networking multiplexer in the industry. It is intended to be a feeder multiplexer on a corporate backbone net or a point-to-point device with support for centralized net management.

The 3606 has a single V.21 or V.35 trunk interface and four synchronous or asynchronous V.24 or RS-232 local data ports that each operate at speeds up to 38.4K bit/sec. Optional modules can be added to provide two additional voice or data ports.

The 3606 supports Newbridge's 8K and 16K bit/sec High Capacity Voice compression technique, as well as subrate data multiplexing and multidrop data circuits.

The 5638 MainStreet SNMP Manager enables users to graphically represent and manage non-Newbridge LAN devices from the

(continued on page 111)

VA's IS chief lobbies for network-based applications

Says technology is key to better veteran services.

By Ellen Messmer
Washington Correspondent

WASHINGTON, D.C. — Speaking at a conference here last week, the Department of Veterans Affairs' (VA) information systems chief said the organization desperately needs an infusion of network technology to improve services to veterans.

Robert Woods, the VA's principal deputy assistant secretary for information resources management, said he is struggling to convince the VA's senior management that the agency must invest in its information infrastructure in order to improve services.

"It's not a luxury of choice," Woods told attendees at the Government Workplace Conference. The agency must make changes to its network or its services may fall so far behind those offered by the private sector that the VA may become obsolete.

Woods, who joined the VA three months ago, says the agency is providing inadequate services to veterans, largely due to the outdated information systems in place.

"We haven't structured the data systems around the client," Woods said. "The computer systems are only for administrative support. Once [management] realizes it has a business problem, things will start happening."

The VA needs to make an organizational commitment to marry network technologies such as electronic data interchange and client/server computing to specific VA programs in order to bolster service, he added.

As the nation's largest civilian agency with a $33 billion annual budget, the VA has about 240,000 employees operating 172 hospitals and several warehouses for prescription drugs across the

(continued on page 111)

GSA orders five utilities to comply with FTS 2000

Move could devastate firms' expansion plans.

By Ellen Messmer
Washington Correspondent

WASHINGTON, D.C. — The General Services Administration last week ordered five federally operated power authorities to migrate to the Federal Telecommunications System (FTS) 2000 network, a move that could force the users to pull the plug on existing microwave nets.

The move could also throw the users' network expansion plans into a state of disarray and hamper the construction of new power-generating facilities now under way.

Under a GSA order, the electric-generating companies — the Alaska Power Administration, Bonneville Power Administration, the Southeastern Power Administration, the Southwestern Power Administration and the Western Area Power Administration — must migrate all telecommunications facilities to FTS 2000 by Sept. 30.

The GSA order received last week by the five utilities nullifies a previous blanket exemption to FTS 2000 granted to them in 1988. Moreover, the order does not explain the GSA's reasons for reversing the earlier exemption.

In a May 23 letter from Francis McDonough, GSA's deputy commissioner for federal information resources management, the GSA informed the Department of Energy — which oversees the five power administrations — to migrate them to FTS 2000. The Energy Department is assigned to AT&T under the FTS 2000 contract.

"DOE shall transition all telecommunications facilities and services previously acquired under the authority of this blanket exception, to the FTS 2000 network, unless granted a specific exemption by GSA," McDonough's letter stated.

Congress has required mandatory use of FTS 2000 as a means of ensuring the government can earn volume discounts on the contract's long-distance services provided by AT&T and US Sprint Communications Co.

The order also stipulates that the five companies, which specialize in providing electrical power wholesale to private-sec

(continued on page 115)

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AT&T Tridom offers VSAT router to send TCP/IP data via satellite

By Bob Brown
Senior Editor

MARIETTA, Ga. — AT&T Tridom last week announced a router for its very small aperture terminals and VSAT hubs that enables users to transmit TCP/IP data between local-area nets via a satellite link.

The AT&T subsidiary, based here, said the VSAT router will provide users with better performance at less cost than protocol converters, which are capable of transmitting LAN data on a point-to-point basis between a remote VSAT and a private or shared VSAT hub.

AT&T Tridom will demonstrate for the first time its Ethernet Router Option at the International Communications Association conference in Anaheim, Calif., this week.

The Ethernet Router Option is a single card that fits into the VSAT's indoor unit. Users must deploy router cards at remote sites as well as a central VSAT hub, where the bulk of LAN routing is performed.

The VSAT router supports the Routing Information Protocol, which transmits data over as many as 16 hops between routers. However, the Ethernet Router Option will only transmit data on a point-to-point basis to the central hub.

The remote VSAT router card is capable of forwarding 100 packet/sec, while the hub router transmits up to 1,000 packet/sec, according to Michael Brown, an AT&T Tridom product manager.

The router wraps Transmission Control Protocol/Internet Protocol data in an envelope based on AT&T Tridom's implementation of an Open Systems Interconnection protocol stack and transmits it to a VSAT hub, which either strips away the OSI-like packet and presents the data to a local Ethernet or beams the data to another VSAT site, where it is handed off to a LAN.

According to Brown, the Ethernet Router Option provides users with several benefits over a protocol converter. Whereas the AT&T Tridom router is an integrated VSAT unit card, protocol converters are stand-alone devices that present an added potential point of network failure, Brown said.

More importantly, the VSAT router transmits LAN traffic more efficiently and quickly than a protocol converter, he said. Routers also do a better job of filtering out noise on the network.

AT&T Tridom's Ethernet Router Option is scheduled to be available in August. The VSAT cards will cost $1,495 each, while the hub cards will sell for $3,300 apiece.

Navistar needs VSAT routers

Navistar International Transportation Corp., the largest U.S. maker of medium and heavy-duty trucks and diesel engines, is beta-testing the Ethernet Router Option. Following completion of the trial, the Chicago-based truck builder plans to install the router at as many as 600 dealerships on its new nationwide VSAT network.

Navistar's dealers are using the new net, which replaces a low-speed terrestrial network, to access the company's data center and other dealerships for ordering parts and issuing service contracts, among other things.

AT&T Tridom is not the first VSAT mak-

(continued on page 113)

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UB concentrator limits jitter on 16M bit/sec nets

By Caryn Gillooly
Senior Editor

SANTA CLARA, Calif. — Ungermann-Bass, Inc. this week will introduce a concentrator for its Access/One wiring hub designed to increase the maximum number of stations that can be supported on 16M bit/sec unshielded twisted-pair token-ring nets by limiting jitter.

The concentrator, Ungermann-Bass' first product supporting 16M bit/sec over unshielded twisted-pair wire, can link as many as 255 nodes spaced 100 meters apart, compared to 72 nodes on local-area networks using standard media access units (MAU) that do not filter signals.

Without filtering, the jitter created at each station in 16M bit/sec networks eventually builds up and distorts the signal beyond recognition. This limits these types of networks to a maximum of 72 nodes.

"Our goal was to allow customers to use existing cable plants for 16M bit/sec token-ring transmission," said Marty Thomas, product manager for the concentrator. "With this [concentrator], customers can not only use existing cable, but can build much larger rings."

The concentrator comes in two parts: The ASM 410T, an active concentrator that supports 12 token-ring stations; and the AMO 410T/2 daughter card, an add-on that addresses the jitter problem.

The offering fits as a module into Ungermann-Bass' Access/One smart wiring hub. The Access/One uses plug-and-play modules to support personal computer LANs, as well as Apple Computer, Inc. Macintosh nets, terminals, minicomputers and mainframes. The hub can support Ethernet, token-ring, broadband or Fiber Distributed Data Interface environments.

According to the vendor, only one other company, Proteon, Inc., has attempted to solve the jitter problem common on high-speed unshielded twisted-pair networks. Jitter is a change in the transmission signal caused by the wire and different stations on the network. The greater the distance the signal travels, the more distorted the signal becomes.

Proteon sells a product called the Jitter-Buster for individual token-ring stations. Ungermann-Bass claims that the concentrator is a more convenient place to eliminate jitter because, as with any capability that resides on an individual station, the device must be operating to take advantage of on-board electronics.

Thomas said Ungermann-Bass has applied for a patent on the jitter elimination technology and also disclosed its design to the IEEE 802.5 Token Ring committee for possible standardization.

This release represents the first products from a commitment that Ungermann-Bass made more than two years ago to support 16M bit/sec token-ring transmission over unshielded twisted pair.

"In May 1989, we pledged to deliver a concentrator, adapter cards and a full suite of products for 16M bit/sec over [unshielded twisted pair]," said Bob Jordan, group director of product marketing for Ungermann-Bass. "Now we're fulfilling that promise."

When Ungermann-Bass originally announced its intentions, the company said it would deliver products by the third quarter of 1990, Jordan said.

The concentrator, which will be priced at $1,150, and daughter board, which will cost $1,900, are due out this July. ◻

MCI plans int'l switched 64K bit/sec for '92

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — MCI Communications Corp. last week announced it has begun testing an international switched 64K bit/sec service with several customers, including Northern Telecom, Inc. and The Gap, Inc.

The service, which is scheduled to be available in early 1992, will initially be offered only to the U.K. in conjunction with British Telecommunications PLC. MCI will not announce pricing until the service is available commercially, said a spokeswoman for the carrier.

According to MCI officials, the higher bandwidth switched 64K bit/sec service will enhance such user applications as videoconferencing and bulk data transfer.

Analysts last week said the international switched 64K bit/sec service will make it easier for users to interconnect with foreign networks since most other countries have based offerings on the 64K bit/sec bandwidth. They added that 64K bit/sec lines are a building block for Integrated Services Digital Network applications.

MCI is trailing its two major competitors, AT&T and US Sprint Communications Co., in offering the service. AT&T began

(continued on page 116)

IVAN to install data net node in Hong Kong

By Barton Crockett
Senior Editor

ANAHEIM, Calif. — At the International Communications Association conference here this week, BT North America, Inc. will announce plans to open a new public data network node in Hong Kong and reveal that it has expanded service in seven other countries.

The international value-added network (IVAN) service provider plans to open the Hong Kong node this month, according to JoAn Couche, BT North America's director of regulatory affairs in San Jose, Calif.

The new node will enable BT North America to significantly reduce prices for IVAN services to Hong Kong, Couche said. This is because the company currently must route IVAN traffic to Hong Kong via the local public data net maintained by Hong Kong Telecom International, the country's monopoly carrier. By using its own node, BT North America will reduce provisioning costs.

Couche said BT North America is opening the Hong Kong node now because new laws were passed in January that significantly lessen restrictions on foreign-owned IVANs in that country.

For example, until this year, Hong Kong Telecom added surcharges of about one-third of the price of an international private line on top of international private

(continued on page 114)

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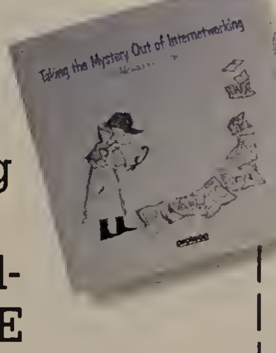

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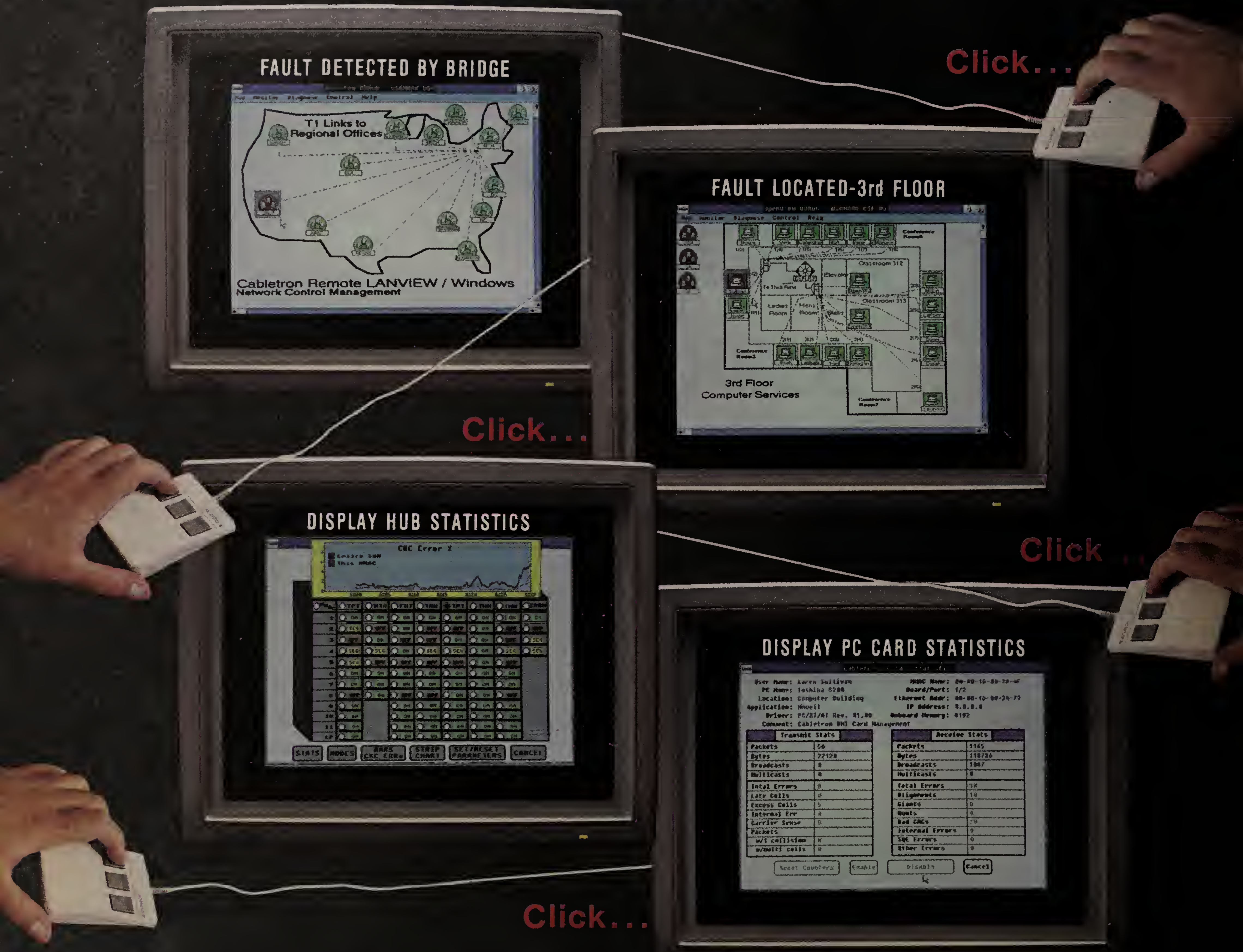

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INDUSTRY UPDATE

VENDOR STRATEGIES, MARKET TRENDS AND FINANCIALS

Worth Noting

"The recent merger and acquisition activity [in the network market] has been mainly the result of companies failing. I think we'll see more consolidation as a result of successful marketing and technical alliances."

Henry Nothhaft
President and
chief executive officer
David Systems, Inc.
Sunnyvale, Calif.

People & Positions

Axel Leblois last week was named president and chief executive officer of **Bull HN Information Systems, Inc.**, which is responsible for **Groupe Bull SA**'s U.S./North American and Pacific Rim operations.

He replaces **Roland Pampel**, who will advise Leblois during a transition period. Pampel elected not to accept a Groupe Bull assignment in Paris for personal reasons.

Leblois previously was chairman and CEO of International Data Corp., a Framingham, Mass., market research firm.

Blue Bell, Pa.-based **Unisys Corp.** last week announced that **Hugh Lynch,** formerly senior vice-president of the Unisys Computer Systems Product Group, was named president of the division.

In his new position, Lynch will have responsibility for all Unisys product development, engineering and manufacturing operations worldwide. He will direct the product implementation of the Unisys architecture plans based on open systems networks for transaction processing. Lynch replaces former Unisys President **Cyril Yansouni** who left to become chairman of Milpitas, Calif.-based Read-Rite Corp.

"The numbers I've seen for data networking are 20% growth for the next five to 10 years. You can't turn away from that."

Salvatore Alini
Managing director
Data Networking Services
Nynex Corp.

Alini maps out strategy for new Nynex data group

Identifies several key markets, hints at alliances.

Q&A Nynex Corp. recently named Salvatore Alini, formerly vice-president and general manager of Concurrent Computer Corp., as managing director of its new Data Networking Services group. (The data communications group falls under Nynex's Telesector Resources Group, a subsidiary of New York Telephone Co. and New England Telephone and Telegraph Co.) In a recent interview with *Network World* Senior Editor Bob Brown, Alini discussed Nynex's data communications plans.

Why has Nynex decided to form a data communications group?

Nynex recognizes that the data networking market is a significant growth opportunity. The numbers I've seen for data networking are 20% growth for the next five to 10 years. You can't turn away from that, since Nynex plays a significant role in that business already. About $1 billion of Nynex's business is tied up in data communications. Why not grow along with the data communications market, particularly when voice is not growing at that rate and may even be flat?

What types of services will Nynex's data communications group offer?

We are focusing on [several] market sectors. One that has a lot of potential is on-line transaction processing. If we can put together applications-oriented products that instead of being based on bits per second [are based on the number of] transactions per second, I think we'd be in a good position to offer unique services.

Another market segment we are looking at is the information providers market — companies such as Dow Jones [& Co., Inc.], Telerate [Inc.] and Prodigy [Services, Inc.] [Nynex should be able to address the needs of] those companies, which do a fair amount of data networking to provide services to businesses and residences.

A market that is small today but is going to explode is LAN interconnection. LAN interconnection coupled with frame relay services is likely to be a growth opportunity because the market is just beginning to evolve and there aren't any dominant players. LAN internetworking is a subset of another market — enterprise networking — an opportunity to provide end-to-end telecommunications facilities.

"About $1 billion of Nynex's business is tied up in data communications. Why not grow along with the data market?"

▲▲▲

Will Nynex attempt to provide all of these services by itself?

In every one of these sectors, I think Nynex, as well as most of the RBHCs and common carriers, have concluded they cannot do everything themselves. Partnerships are a very high priority from my perspective. I'm proposing to create alliances and a partnership program with value-added resellers, some of the [value-added network providers], maybe even CPE vendors and computer vendors that may be interested in teaming on certain regional telecommunications and information processing ventures.

With the recession, companies are looking for new ways to do

(continued on page 12)

3Com aims to recast its reseller channel

Firm unveils program to lure network integrators, refocus existing resellers on internetworking gear.

By Bob Brown
Senior Editor

ATLANTA — 3Com Corp. recently unveiled a program at Comdex/Spring '91 here to lure network integrators to market its internetworking products and to bring existing resellers up to speed on selling and supporting those product lines.

The vendor's Network Systems Integrator program is a signal the company is trying to refocus its sales channel on internetworking product lines. Several months ago, 3Com exited the local-area network operating system market ("3Com bows out of LAN software mart," *NW,* Jan. 14).

3Com officials said the company would pursue reputable integrators who are already skilled at installing internetworking equipment and providing training and post-sale support.

But company officials stressed they will expend a good deal of effort training existing resellers of 3Com's LAN adapters to acquire the technical skills and expertise needed to sell 3Com's LinkBuilder hubs, NETBuilder bridges and routers, and CS/2000 and CS/2001 terminal servers.

"We're not going to go out and sign 100 new network integrators," said Rick Burgess, 3Com's director of marketing. "We're focusing on quality, not quantity."

While it may take these firms several months to get up to speed on selling, installing and supporting 3Com's internetworking gear, users will be better served in the long run, Burgess said. 3Com already sells most of its internetworking gear via resellers and systems integrators, though internetworking products have not been a top priority for many of them up until recently, due to growing user demand and the promise of good profit margins, he said.

Several years back when 3Com acquired Bridge Communications, Inc., it inherited a direct sales force well versed in marketing internetworking products, but 3Com has de-emphasized direct sales since then, Burgess said. Direct sales only account for

(continued on page 12)

INDUSTRY BRIEFS

Netrix inks mux reseller. Netrix Corp. last week announced that Graphnet, Inc. of Teaneck, N.J., will market the Netrix #1-Integrated Switching System (ISS) line under a new reseller agreement. The #1-ISS line of switches can be used for wide-area packet switching, circuit switching or frame relay. Graphnet currently operates a public data and messaging network, which uses Netrix switches. Under the agreement, Graphnet will market the Netrix equipment under the name GDS-1544 to its end-user customer base interested in hybrid public/private networks. To support the new sales effort, Graphnet has appointed Larry Bellman as manager of private network sales. The company also announced that it will offer facilities management services under outsourcing agreements.

RBHC to buy cellular service provider. Ameritech last week said it has signed an agreement to purchase CyberTel Financial Corp. and its subsidiaries, which provide cellular communications services in the St. Louis area. Ameritech will pay $512 million for the companies.

Louis Rutigliano, Ameritech executive vice-president, said the acquisitions fit in with the carrier's vision of the cellular and wireless communications marketplace. Ameritech estimates the acquisition will be completed by the third quarter.

FiberCom to sell Wollongong wares. The Wollongong Group, Inc. last week announced that it has licensed FiberCom, Inc. to sell Wollongong's Management Station network management software. The FiberCom version, called

(continued on page 12)

1975 *Launched the first U.S. public data network.* 1979 *Built the first commercial private packet network.* 1980 *Created the first hybrid network using private and public*

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1988 *Sprint completes the only nationwide 100% digital fiber optic network. Awarded 40% of Federal Telecommunications System 2000 contract.* 1989 *World's first and largest*

1985 *Sprint introduces the world's first VPN.℠* 1986 *First transcontinental fiber optic call transmitted by Sprint.* 1987 *Eight million FONCARDs℠ distributed in first year.*

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privately-owned transatlantic fiber optic cable completed. 1990 *Sprint announces first commercial video services to the Soviet Union. Sprint introduces first nationwide ISDN capabilities.*

3Com to recast its reseller channel

continued from page 9

about 10% of 3Com's overall sales, and most of those sales are to government accounts, he added.

3Com plans to expand its internetworking sales channel by making products available through its current distributors and dealers, most of which focus on 3Com's adapter boards or terminal servers. Distributors and dealers will need to meet 3Com technical, training and support requirements for these products.

3Com also plans to help value-added resellers — many of which have focused on 3Com's LAN adapters — to sell internetworking gear, Burgess said.

To entice existing internetworking resellers and systems integrators to join 3Com's channel network, the Santa Clara, Calif., company is offering sales development kits and training programs that focus on such services as network implementation and post-sales support.

3Com is introducing a similar program in Europe targeted at national and Pan-European network integration centers already serving 3Com's European customer base.

According to Ray Melcher, a vice-president at Hi-Tech Connections, Inc., a Reading, Pa., reseller and network systems integrator, 3Com's Network Systems Integrator program should provide a boost to 3Com's channel network, the quality of which varied greatly from reseller to reseller.

"3Com has implemented a program that should provide benefits to the end-user community," said Melcher, whose company recently began reselling 3Com's complete line of internetworking products. "The program's focus will be on supporting network systems integrators who have the technical and financial capabilities to deliver a full range of pre- and post-sales services and products of the highest quality." ◘

> 3Com plans to expand its internetworking sales channel by making products available through its current distributors.
>
> ▲▲▲

Alini maps strategy for Nynex group

continued from page 9

business. Look at the computer industry. It's flat on the balls of its feet at this point. I'm pretty sure that Nynex can negotiate some reasonable agreements where both corporations have a winning strategy.

The RBHCs don't have a great reputation in the data communications market. Is that something Nynex will need to overcome?

I think that is a perception to a large extent by the customer base. [T]here is certainly room for improvement and that's one of the reasons that the Data Networking Services group was formed.

What are your goals for the group this year?

My primary objective this year is putting together a business strategy that is focused and simple, and can be articulated to our customer base and distribution channel. I'd like to be able to introduce some applications and services [for the markets] I have mentioned and would like to initiate alliances with some strategic partners. ◘

Industry Briefs

continued from page 9

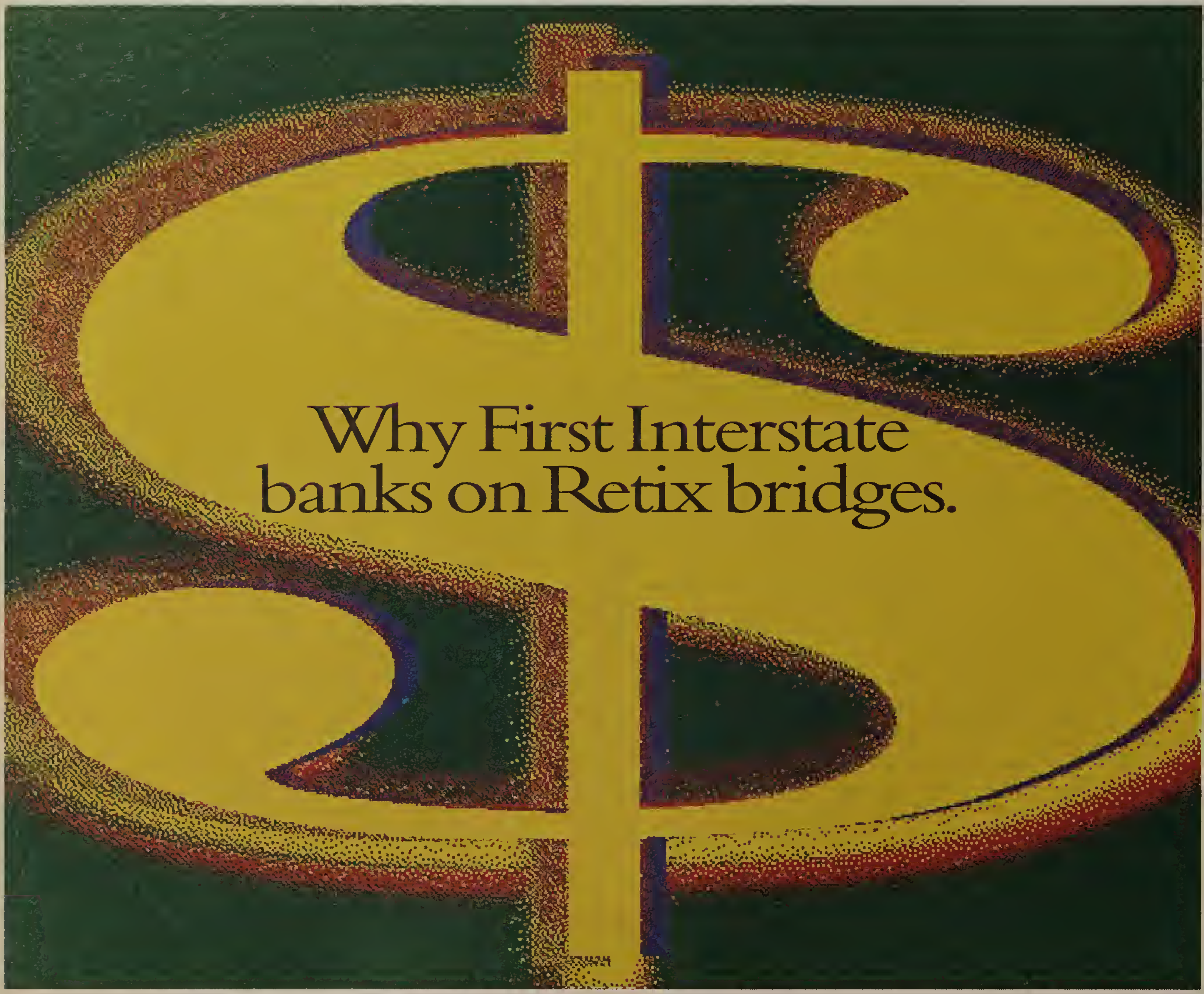
ViewMaster+, is modified to provide net management for the company's Fiber Distributed Data Interface RingMaster bridge product.

Management Station is designed to operate on Sun Microsystems, Inc.'s line of SPARCstations, Motorola, Inc.'s Multi-Personal Computer and Digital Equipment Corp.'s DECstation and DECsystem product group, as well as 80386-based compatibles using Open Desktop from The Santa Cruz Operation, Inc.

Rockwell unit teams with Syntellect. Rockwell International Corp.'s Switching Systems Division and Phoenix-based Syntellect, Inc. last week announced an agreement to share information in order to foster interoperability between Syntellect's interactive voice response (IVR) systems and Rockwell's Galaxy automatic call distributor (ACD).

Rockwell plans to pass automatic number identification information directly from its ACDs to Syntellect's INFOBOT IVR systems, according to a Syntellect spokesman.

The software upgrade, planned as an enhancement to the INFOBOT line, should be available within three months. ◘


Why First Interstate banks on Retix bridges.

"Of all the remote bridges we tested, only the Retix 4880 gave us the performance we were looking for, the reliability we wanted, and the support we needed."

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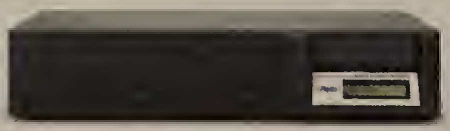
"A lot of manufacturers claim their bridges are self-learning—the Retix bridge was the only one we tested that really is."

"If I ever build another network, Retix will be the first people I talk to."

"These things are bulletproof."
—*Richard Reyna*
Assistant Vice President
First Interstate Bank, Ltd.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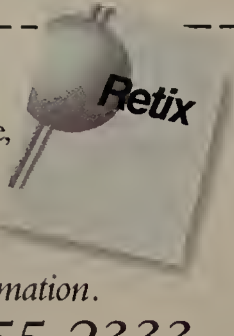

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TELECOMMUNICATIONS

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Worth Noting

The European ISDN service and equipment market will swell from $5.5 billion in 1990 to $13.6 billion by 1997, according to a new report by Market Intelligence Research Corp., a Mountain View, Calif., consultancy.

Carrier Watch

AT&T Network Systems Group last week announced an agreement to provide **Nevada Bell** with digital switching equipment that will eventually make the Bell operating company's statewide network almost fully digital.

Under the agreement, Nevada Bell will install AT&T 5ESS digital central office switches in the following Nevada cities: Carson City, Churchill Butte, Lockwood, Silver Springs, South Reno, Sparks and Virginia City.

Also, a second switch in Reno, Nev., will be equipped to support 48,000 additional lines.

The new switches will enable Nevada Bell to broaden the reach of advanced network services such as Integrated Services Digital Network.

RCI Long Distance, a subsidiary of **Rochester Telephone Corp.,** recently announced a conference calling service that enables users of its OMNI Travel Card to set up conference calls from public pay phones throughout the U.S.

To use the service, a caller schedules a date and time with a conference coordinator, who in turn notifies each conference participant.

At the appointed time, the caller dials a toll-free number, enters a card number and presses *2.

The conference coordinator sets up the call and is available during the call for further assistance.

Hotel chain purchases an existing Tariff 12 option

Choice Hotels will begin saving money sooner.

By Bob Wallace
Senior Editor

SILVER SPRING, Md. — Choice Hotels International, Inc. recently bought an existing AT&T Tariff 12 option rather than undergo the arduous process of forging its own deal.

The hotel chain became one of a growing list of companies to buy Virtual Telecommunications Network Service (VTNS) Option 32, a three-year arrangement with a $3.1 million minimum annual charge that was first filed for Colonial Penn Group, Inc. of Philadelphia in 1990.

"The main reason we went with an existing option was because we wanted to start realizing huge savings much sooner than if we built our own option," said Jim Yoakum, Choice Hotels' senior vice-president of information systems.

Some users prefer existing options because they're not subject to Federal Communications Commission approval and do not require a new filing. Conagra, Inc., Gillette Co., Norton Co. and Polaroid Corp. have already signed up for Colonial Penn's Tariff 12 option.

AT&T provides the leased lines for Choice Hotels' current private data network and the bulk of the company's 800 service for six major reservation centers, which are networked with multiple 56K bit/sec lines.

The company spends $30 million a year on AT&T services. Choice Hotels also uses MCI Communications Corp. and US Sprint Communications Co. services for some outbound voice traffic.

Choice Hotels' 56K bit/sec lines and inbound 800 service will be brought under the Tariff 12 arrangement. The company is also considering adding 9.6K bit/sec lines to link various properties under the deal.

"We estimate we'll save about 30% on our Megacom [800] traffic by pulling it under Tariff 12," Yoakum said. "And if we decided on a new option, we could have been paying full price for that service for some time."

Customers that buy an existing option must agree to the deal's length, its minimum annual charge and the use of at least the same number of switch ports and lines. All customers on an option must approve changes before they are enacted.

Yoakum, who helped negotiate a Tariff 12 deal for Marriott Corp., considered three other existing custom arrangements, in-

(continued on page 15)

WASHINGTON UPDATE

BY ANITA TAFF

Senator calls for crackdown on 900 services. In response to a report from the National Association of Attorneys General that said Federal Communications Commission efforts to regulate the 900 industry don't go far enough, Sen. Daniel Inouye (D-Hawaii) recently proposed federal action.

Inouye introduced a bill, the Telephone Consumer Assistance Act, that would establish regulatory requirements for the industry that go beyond what has been suggested by the FCC. An FCC proposal released in March concentrates primarily on providing consumers with information on the cost and content of 900 services prior to incurring any charges.

Inouye's bill contains several other measures, such as banning 900 services aimed at children under 16, requiring 900 providers to register with the Federal Trade Commission and prohibiting referrals from 800 to 900 numbers, a technique used by some providers to induce consumers to call without making it clear that there will be a charge for the 900 service.

NATA comes out against cellular bundling. The North American Telecommunications Association (NATA) recently declared its opposition to a Federal Communications Commission proposal to allow companies to sell cellular telephone equipment and cellular phone service together.

(continued on page 15)

Status of AT&T's Tariff 15 deals

Company	Legal status	Competitor
1. Holiday Corp.	Rejected	MCI
2. Resorts Condominium Int'l, Inc.	In effect*	MCI
3. First Commerce Corp.	Withdrawn	US Sprint
4. CBS, Inc./Shawmut Bank, N.A.	In effect**	MCI
5. La Quinta Motor Inns, L.P.	In effect*	MCI
6. The East Ohio Gas Co. Swift Global Communications, Inc.	In effect*	MCI US Sprint
7. Pepsico, Inc.	Rejected***	US Sprint
8. Original Cookie Co.	In effect*	US Sprint
9. Schwan's Sales Enterprises, Inc.	In effect*	MCI
10. Deluxe Corp.	In effect*	MCI
11. Rohm & Haas Co.	Withdrawn	US Sprint
12. State Street Bank & Trust Co.	Suspended until 9/13	US Sprint
13. Kentucky Christian College	Suspended until 9/13	MCI
14. The Dun & Bradstreet Corp.	Withdrawn	MCI
15. Thomson Communication Services	Suspended until 10/30	US Sprint
16. SIEBE Group	Pending	MCI
17. VoiceCom Systems, Inc.	Pending	US Sprint
18. Union Carbide Corp.	Pending	MCI

* Took effect after 5-month suspension; no ruling on lawfulness.
** Option took effect, but both customers already switched to another carrier.
*** Switched to a Tariff 12 deal.

GRAPHIC BY SUSAN J. CHAMPENY SOURCE: *NETWORK WORLD*

US Sprint cries foul over Tariff 15 deals

Carrier complains to FCC that AT&T has broken the rules laid for off-price network arrangements.

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — In a strongly worded protest against Tariff 15, US Sprint Communications Co. recently complained to the FCC that AT&T has gone beyond the rules originally outlined for the off-price network deals.

The Federal Communications Commission has said it will settle the question of Tariff 15's legality by Sept. 21, but US Sprint said it can't wait that long. The carrier claims that AT&T, in its zeal to get new customers, is offering Tariff 15 options that violate the conditions under which it is allowed to provide such deals.

Tariff 15 lets AT&T single out certain customers for discounted service in direct response to competitors' offers. AT&T is only allowed to match, not beat, competitors' deals.

But US Sprint claims that AT&T has made offers to customers that bear only slight resemblance to rivals' deals and, in some cases, where no rival dealexists.

The carrier contends that AT&T is also trying to do an end run around regulators by selling existing Tariff 15 deals to multiple customers, which obviates the need to file new tariff proposals and wait for FCC approval.

"AT&T is obviously using the existing Tariff 15s as a totally unjustified device for providing service to new customers on an off-tariff basis," said John Hoffman, senior vice-president of external affairs at US Sprint, in a letter to the FCC.

In addition, US Sprint officials say AT&T is attempting to stuff the ballot box by stepping up efforts to add Tariff 15 customers.

"You could say the reason is to create a constituency before the issue is decided," said Leon Kestenbaum, vice-president and general regulatory counsel for US Sprint. The more customers that get discounts under Tariff 15, the more difficult it will be for regulators to reject the deals.

But adding new customers to Tariff 15 isn't illegal. In fact, the case could be made that it's good business sense for AT&T to use its every advantage to win approval of Tariff 15.

Irony abounds

An AT&T spokesman said the carrier finds it ironic that US Sprint would object to AT&T selling Tariff 15 deals to more than one customer when US Sprint and other rivals originally protested the discount deals as discriminatory because they were targeted at a single customer.

Kestenbaum said, however, that AT&T is intentionally pressing forward with the deals even

(continued on page 15)

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When choosing an Ethernet LAN, simply ask yourself one question.

Do I want a headache? Or not?

The new HP EtherTwist Hub takes the pain out of networking.

Running a LAN over your phone lines should be easy. But the mess of cables on the left is the way most Ethernet LANs connect with your wiring closet: one cable for every PC.

Hewlett-Packard has a better way.

The HP EtherTwist Hub connects as many as 12 PCs into a LAN, using a single cable. When you're ready to grow, simply plug in another Hub.

That way, you can control your growth in easy 12 PC increments, instead of 120. Or instead of smaller hubs that still need one cable linking every single computer to the wiring closet.

Of course, the HP EtherTwist Hub supports 10Base-T, and is compatible with Novell and LAN Manager. So call **1-800-752-0900, Ext. 2006** for more information on the HP EtherTwist LAN. You'll see how HP has turned a difficult choice into a very easy one.

HEWLETT
PACKARD

US Sprint cries foul over Tariff 15 deals

continued from page 13

though it knows the FCC has serious reservations about the legality of Tariff 15. The commission has found two of the deals unlawful and delayed the others for the maximum time allowed for investigation.

According to Hoffman, AT&T has clouded the marketplace and confused users about what services it can legally offer.

"This has made fair competition more difficult and enhances AT&T's efforts to cement its dominant position," he said.

An AT&T spokesman said the carrier intends to respond to US Sprint's allegations in a letter to the FCC but had not done so by press time.

Difficult issues

AT&T and rival carriers have had a running battle over Tariff 15 since it was introduced in 1988. The debate over Tariff 15 raises many of the thorny issues that the FCC has been wrangling over with regard to how much flexibility AT&T should have in an increasingly competitive marketplace.

Rivals claim that allowing AT&T to offer services at more favorable rates and terms to only a few users violates provisions of the Communications Act of 1934 that prohibit AT&T from discriminating among customers.

AT&T says it must be allowed to respond to competitors' offers in order to compete effectively, a legal principle known as competitive necessity. However, FCC officials have said that competitive necessity has only been used as a legal argument to justify lowering prices for an entire service, not for just a specific customer.

And the commission has been of little help in sorting out the issue. Despite numerous investigations, it has yet to decide whether the deals are legal.

Seven of AT&T's Tariff 15 offers have been allowed to go forward but only because the FCC ran out of time to delay them for investigation.

Those deals are in legal limbo, however, because they have not been judged as lawful by the FCC and technically are still subject to investigation. ◻

Hotel chain buys existing Tariff 12 option

continued from page 13

cluding Hyatt Corp.'s Option 59, before deciding on Option 32. "We wanted to find an option where we would have no problem meeting the number of dedicated lines and the minimum [annual] charge," he said.

Weighing the options

Initially, Choice Hotels solicited a Tariff 12 deal from AT&T, requested its own option and asked for custom network proposals from MCI and US Sprint. "That's a path we seriously considered for awhile but eventually decided against," Yoakum recalled.

The hotel chain chose AT&T because it didn't want to change its 800 numbers in order to move to another carrier. "We invested million and millions of dollars promoting our 800 numbers," Yoakum said. "We just couldn't change them."

In an effort to bring more users aboard while truncating lead times and reducing its own costs, AT&T last year began to encourage potential customers to buy existing VTNS options instead of developing new ones. AT&T has met with some success in that effort. As of May 23, AT&T had filed 89 custom network plans for more than 125 companies under Tariff 12. ◻

Washington Update

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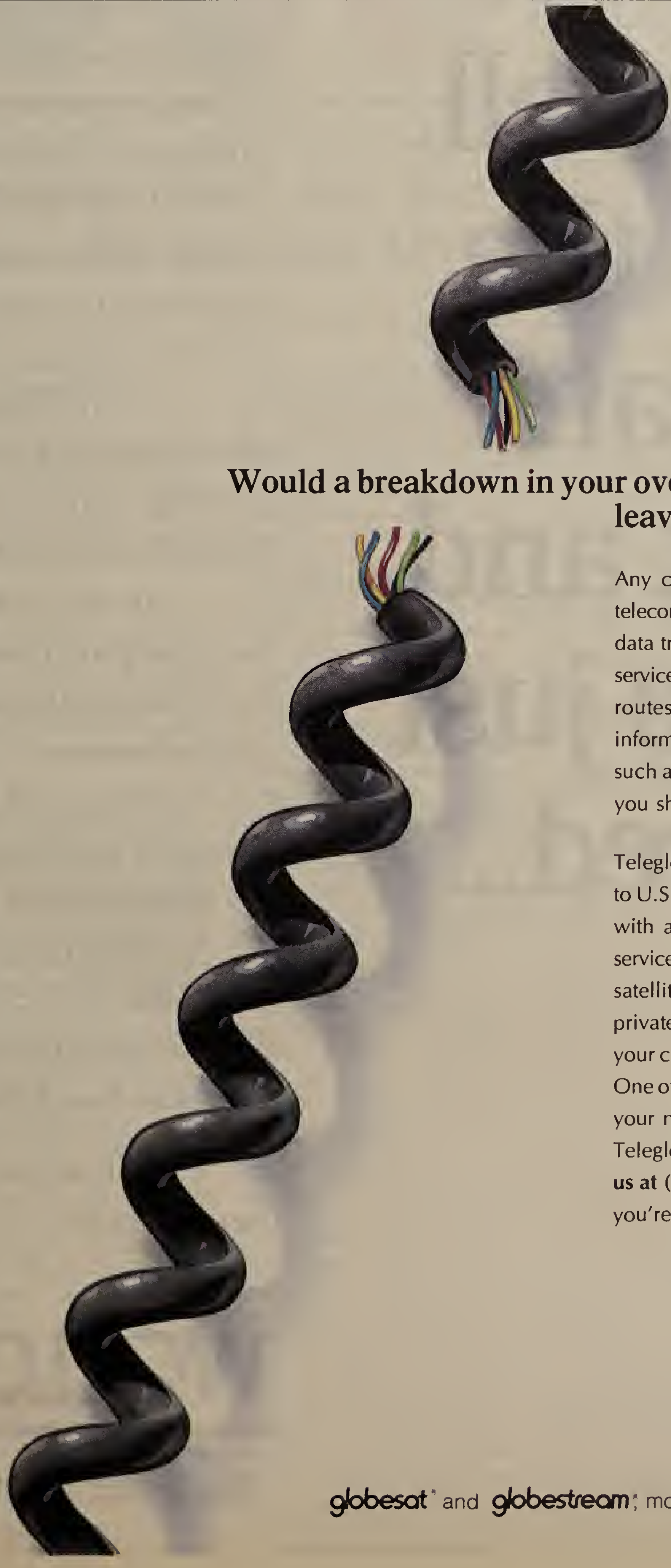
The practice of combining equipment and service, called bundling, is "inconsistent with the Communications Act of 1934 and negates a cornerstone of FCC policies established over the last 20 years," NATA said. It also emphasized that because the cellular market is not fully competitive but based on a duopoly system, there is likely to be a dramatic reduction in customer premises equipment competition if bundling is allowed.

Clarifying FCC rights. Legislation attached to the Federal Communications Commission Authorization Act of 1991 by Sen. Daniel Inouye (D-Hawaii) would amend the Communications Act of 1934 to clarify the FCC's authority to grant common carrier radio frequency licenses to consortia.

The Inouye legislation would remove legal doubts about the FCC's right to license consortia. The U.S. District Court of Appeals last March remanded the 1989 FCC decision granting the American Mobile Satellite Consortium (AMSC), a group of eight firms, the right to construct, launch and operate a satellite system for mobile telephone and data services nationwide.

The challenge to the AMSC plan had been brought by three mobile satellite firms, which did not raise the $5 million cash required to participate. The court questioned whether the FCC had the right to create "forced" consortia from competing applicants, as it did in the AMSC case.

The Inouye legislation would lend support to the FCC as it moves toward issuing its reply to the court's remand in August. AMSC still holds the license and is proceeding with construction of the system. ◻



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Circle Reader Service #134

DATA COMMUNICATIONS

PRODUCTS, SERVICES, ARCHITECTURES, STANDARDS AND NETWORK MANAGEMENT

Worth Noting

SunGard Planning Solutions, Inc. recently unveiled DP/90Banking, a microcomputer-based software tool that enables banks to automate the task of planning for disaster recovery. Available now, the software costs between $22,500 and $57,000.

Data Packets

Larse Corp. of Santa Clara, Calif., this week will announce at the International Communications Association's 44th Annual Conference and Exposition in Anaheim, Calif., a new version of the software for its Split-T access multiplexer that lets users combine several data or voice applications onto a full or fractional T-1 link.

Version 1B of the Split-T software enables users to automatically reassign bandwidth from one port to another at different times during the day. For example, users could reassign at night unused voice channels to data ports in order to support high-speed file transfers.

Also new with Version 1B is an unsolicited alarm dial-out feature that automatically reports Split-T alarm status to a central network management center, obviating the need for a net manager to poll the device.

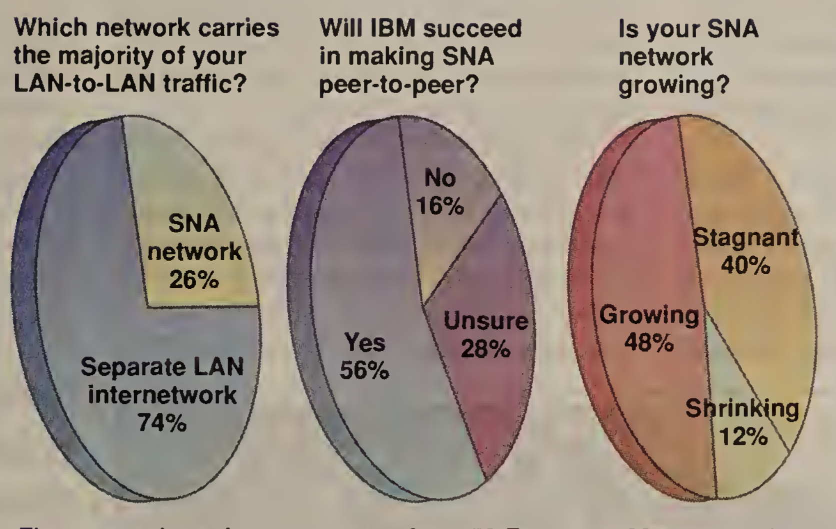
Larse will also announce that its Split-T is now supported under the Codex Corp. 9800 Network Management System, which can be used at a central site to receive data reported via the new alarm dial-out feature.

Version 1B is available now and costs either $200 or $300, depending on the Split-T model.

New Split-T units shipped

(continued on page 22)

How the Fortune 1,000 view SNA



Figures are based on responses from 50 Fortune 1,000 companies.

GRAPHIC BY SUSAN J. CHAMPENY SOURCE: FORRESTER RESEARCH, INC., CAMBRIDGE, MASS.

Forrester study sees dim future for SNA and APPN

Lack of multiprotocol support cited as downfall.

By Paul Desmond
Senior Editor

CAMBRIDGE, Mass. — In a recent report, Forrester Research, Inc. painted a bleak picture of the future of IBM's Systems Network Architecture — largely because SNA is ill-equipped to handle multiprotocol LAN internetwork traffic.

The report also took aim at IBM's Advanced Peer-to-Peer Networking (APPN) strategy, which the research company said will make SNA less hierarchical but will do little to support multiprotocol local-area network traffic.

According to a recent issue of Forrester's "Network Strategy Report," APPN is largely proprietary, useful for only the small number of user applications that utilize LU 6.2 and runs on devices that can be outperformed by less expensive multiprotocol routers.

Forrester's conclusions were based on interviews with 50 Fortune 1,000 companies from a mix of service and manufacturing industries, in addition to briefings from officials at Cisco Systems, Inc., IBM and Novell, Inc.

Today, most users report their SNA networks are still growing (see graphic, this page), but they attributed that growth to factors such as mergers and acquisitions of companies with SNA nets and isolated cases of personal computer users needing access to mainframe applications. Growth is not being stimulated by deployment of new mainframe-based applications, the report stated.

In the long term, users expect to deploy more applications on LANs because they see these networks as a less expensive alternative to mainframes. "Network growth is unequivocally centered in LANs," the report stated.

The bulk of LAN internetworks grew up separately from SNA nets because SNA is unsuitable for handling multivendor LAN traffic, Forrester said. In addition, IBM front-end processors do not have the performance required to handle the increased traffic volume LANs would generate and those devices cost at least 10 times more than LAN routers and bridges, according to the report.

IBM has said APPN, which is intended to make SNA nets less host-dependent, will also let users connect LANs across SNA backbones. The Forrester report points out a shortcoming to that strategy: APPN works only with LU 6.2 sessions, which are used by about half of the users surveyed but rarely for mission critical applications. "[APPN] ignores the multivendor/multiprotocol reality that prevades the Fortune 1,000," the report stated.

Another problem with APPN is the performance of the machines on which it runs. "Dollar for dollar, multiprotocol routers sing in comparison to front-end processors or PS/2s in the router role," according to the report.

Forrester also faulted IBM for not publishing the APPN network node specification. IBM did publish the APPN end-node specification, but end nodes rely on network nodes to supply them with routing data. That configuration makes network nodes the key to the APPN kingdom. "This keeps APPN isolated in a proprietary IBM world," the report stated.

Rick McGee, manager of communication systems architecture in IBM's Communication Systems division, defended APPN by saying multiprotocol LAN routing

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N.C. city broadcasts SNA data via radio

Omnidirectional radio net doubles Charlotte's net bandwidth over leased lines, pays off in one year.

By Paul Desmond
Senior Editor

CHARLOTTE, N.C. — A year after installing an omnidirectional radio system to support its Systems Network Architecture network, this city is reporting the system has paid for itself while providing double the bandwidth of the leased lines it replaced.

Charlotte's 900-MHz digital radio-area network, based on equipment from Multipoint Systems of San Carlos, Calif., proved less costly than digital leased lines as it eliminated installation fees, recurring monthly line charges and data service unit/channel service unit (DSU/CSU) costs. In addition, the radio equipment can be installed quickly, is more reliable and provides better response time than the 9.6K bit/sec multidrop digital leased lines it replaced.

"This is the first time we've had a breakthrough in [transmission] technology since digital lines came about," said Guy Hutchins Jr., MIS operations coordinator for the city of Charlotte. "Radio-area networks have given us the flexibility and affordability to expand as we have a need to."

Charlotte originally installed the radio net to support communications between its IBM 4381 mainframe and cluster controllers at five remote city offices.

"Our original system paid for itself in less than a year just on the savings in leased lines," Hutchins said.

That configuration has since been expanded to include nine remote sites. A second radio net has been installed to support links between three Application System/400s and controllers at five remote sites. IBM software running on the mainframe and on the AS/400s allows users of terminals attached to either host to access applications on the other.

Altogether, the city has 20 sites licensed for the radio net. Although exact costs vary for each location, Hutchins said the

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Radio group deploys data support for relief efforts

By Jim Brown
Senior Editor

BELGRADE LAKES, Maine — A group of ham radio operators is expanding the data transmission capabilities of a worldwide radio network that enables countries to electronically broadcast pleas for help in the event a natural disaster knocks out primary communications facilities.

The volunteer group, International Amateur Radio Network (IARN), based here, is currently installing data radio equipment in the Soviet Union and is working to forge the necessary governmental ties that will pave the way for installation of data radio equipment in other nations including China, Cuba and Czechoslovakia.

"We're aggressively trying to get all those places in the world that don't have this type of equipment up-to-speed and on-line with us," said Glenn Baxter, IARN's founder and manager. Currently, less than half of the 200 countries that have joined the IARN can support data traffic over ham radio.

IARN member Dave Larsen recently got IBM to donate a Personal System/2 L40SX laptop computer to bring the Soviet Union into the data network. Larsen, a chemistry professor at Virginia Polytechnic Institute and State University in Blacksburg, is currently in the Soviet Union ironing out last-minute details.

The move to bring data radio to the Soviet Union comes after Soviet ham radio operators tapped into IARN with voice messages requesting emergency aid following a massive earthquake in Armenia in 1988. They subsequently joined the network.

Radio modems enable ham operators to attach a microcomputer — including battery-operated laptops — to the radio, which can also run off batteries in the event of a power loss. Operators can then transmit telextype messages containing a list of specific aid supplies and medicines needed for disaster relief to IARN headquarters. Those re-

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N.C. city broadcasts SNA data via radio

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city budgets $5,200 for each site brought onto the radio net. That includes the cost of a Multipoint Networks RAN 19 radio transceiver, which supports a 19.2K bit/sec link, an antenna and cabling.

That equipment eliminates a DSU/CSU, which costs at least $600, recurring line expenses of about $250 per month for a 9.6K bit/sec link and a line installation fee of about $1,200. That translates into a payback period of 14 months or less for each site, Hutchins said.

The key to the radio net is its support for an omnidirectional signal emanating from atop a 15-story building here that houses the city's data center. This positioning means signals are broadcast in all directions, but each has a header that identifies the target radio transceiver.

In that sense, the system is different from microwave transmission systems, which typically transmit data on a point-to-point basis. "If we were doing this by microwave, we'd have 20 dishes on top of this building, all pointing at different locations," Hutchins said.

Support for an omnidirectional signal also makes it easier to install the system at remote sites. The remote antenna is simply turned until the peak signal is picked up, as is determined by an attached volt meter. Microwave antennas must be pointed within 2 to 12 degrees of their target system in order to work properly, Hutchins said.

Charlotte's radio net also works without a direct line of sight. One remote location, for example, is located behind what Hutchins called a "wall of glass" formed by four buildings. The target location is reached by bouncing the signal off one of the buildings. "We found we got a stronger signal by angling it," he said.

The radio net has also proven to be more reliable than the multidrop leased lines it replaced. "Normally, we would spend about two hours a month downtime on the digital lines that we leased from the phone company due to various factors," including weather and errant backhoes, Hutchins said. "We don't have that anymore."

In addition, the 19.2K bit/sec lines save money on the line interface couplers (LIC) required to connect each data circuit to the city's IBM 3720 front-end processor. Each 19.2K bit/sec line can support twice as many controllers as the older 9.6K bit/sec leased lines, which means the city needs only half as many LICs.

The radio net also incurs less delay as the front end polls each remote controller. With analog or digital lines, there is a delay of at least 4 to 16 msec between the "request-to-send" and "clear-to-send" commands. Because the radio net can operate in full duplex, that delay is now less than 4 msec, Hutchins said. ◘

Ham radio net aids disaster relief

continued from page 17

quests can then be quickly forwarded to relief agencies such as Red Cross International.

Responses to telex-type messages can be made more quickly than relaying verbal requests for supplies because they obviate the need to copy spoken words. Additionally, there is less risk of errors resulting from poor translation or other language barriers.

IARN also uses radio modems to forward messages to relatives in an afflicted area. For example, after a hurricane smashed into several Caribbean islands last year, IARN received messages asking for help in locating various people. Those messages came into IARN headquarters via facsimile, telex, MCI Communications Corp.'s MCI Mail and ham radio.

IARN edited the contents down to the salient points and transmitted them to the ravaged islands, where workers attempted to distribute them by hand. Responses were sent back to IARN headquarters, which then contacted the sender.

Despite the increasing use of data broadcasts, IARN will "never completely lose the need for voice communications," Baxter said. Voice provides the quickest means for alerting international relief authorities and news agencies during the minutes following a disaster.

To send data over ham radios, users attach a microcomputer to a small standalone modem made by vendors such as Advanced Electronics Applications, Inc. of Lynnwood, Wash. The modem sends data to the microphone port of the ham radio, which broadcasts it. Incoming data is passed to the modem via the radio's speaker port.

The modem uses the Amateur Teleprinting Over Radio (AMTOR) protocol to transfer a short data packet typically about 24 bits in length and addressed to a radio with specific call letters. The intended receiver acknowledges receipt of the packet before the sender broadcasts another. If an error is detected in transmission, the receiver asks for a retransmission.

Also, the modem also supports a derivative of the X.25 protocol that transmits variable-length packets of more than 1,000 bytes each to a relay radio that acts as a store-and-forward host. Using store-and-forward enables a sender to reach multiple destinations with a single transmission but requires the ham operator to act as the relay station for forwarding messages. AMTOR enables two ham operators to establish a direct link. ◘

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Circle Reader Service #121

AT&T files with FCC for Accunet Switched 1536 T-1 pricing, sites

By Jim Brown
Senior Editor

BASKING RIDGE, N.J. — AT&T recently filed pricing information for its Accunet Switched 1536 T-1 service with the Federal Communications Commission, along with the initial list of cities where it will be available.

Announced last November, the service is scheduled to be available July 1 ("AT&T sets stage for switched T-1 service," *NW,* Nov. 19, 1990). Pricing for the first minute of each call ranges from $4.29 to $8.43, while each additional minute varies from $2.37 to $6.51, depending on mileage (see graphic, this page).

The service will initially be offered from AT&T points of presence in Atlanta; Chicago; Freehold and New Brunswick, N.J.; Oakland, Pleaston, Salinas, San Jose and Walnut Creek, Calif.; and Tucson, Ariz. Other cities will be announced later this year.

AT&T was to have offered the service in more than 100 cities by this summer but revamped its plans. It originally had hoped to create demand for the service by making it widely available but is now saying it will add cities as customer demand requires.

Switched 1536 will enable users to establish dial-up T-1 connections supporting throughput of 1.536M bit/sec and to maintain such applications as videoconferencing, bulk data transfer, imaging and T-1 backup. Switched 1536 complements AT&T's Switched 56, 64 and 384 digital data services.

Users have to access the service using a leased T-1 circuit that supports the Integrated Services Digital Network's Primary Rate Interface, meaning their customer premise equipment must also support the ISDN Q.931 signaling protocol. Also, they must have private branch exchange or T-1 multiplexer interface boards capable of creating an ISDN H11 channel.

If the service is approved by the FCC and becomes available by July 1, AT&T will become the first of the Big Three long-distance carriers to deliver switched T-1 service. MCI Communications Corp. announced last year it will offer a switched T-1 service in the third quarter of this year, while US Sprint Communications Co. has yet to announce a switched T-1 service. ☐

AT&T Accunet Switched 1536 pricing

Mileage	Initial 30 seconds	Each additional 6 seconds
0 to 55	$3.1050	$.2370
56 to 292	3.6545	.3469
293 to 430	4.1970	.4554
431 to 1,910	4.5265	.5213
1,911 to 3,000	4.6365	.5433
More than 3,000	5.1740	.6508

SOURCE: AT&T, BASKING RIDGE, N.J
GRAPHIC BY SUSAN J. CHAMPENY

Amdahl boosts performance of 4745 processor

By Paul Desmond
Senior Editor

SUNNYVALE, Calif. — Amdahl Corp. last week announced enhancements to its 4745 IBM-compatible communications processor that supposedly result in an 80% improvement in system performance.

The vendor also unveiled several new features, including support for T-1 and European T-1 trunks.

The central control unit of the 4745 has been improved with the integration of a static random-access memory chip, a technology that reduces the number of cycles required to access the processor's memory. In addition, Amdahl has added a new channel adapter to the 4745 that reduces internal delays for channel access to the front end's internal bus.

Together, the enhancements can improve the 4745's performance by as much as 80%, said an Amdahl spokesperson.

The company also announced new scanners that support trunks operating at the T-1 speed of 1.544M bit/sec, as well as the E-1 2.048M bit/sec standard. Additionally, the 4745 now supports concurrent data transfer on as many as eight host channels. That allows a maximum of eight hosts to be supported in a single network, an increase from the previous limit of six.

All the new or enhanced products will be available in the third quarter. The high-performance enhancements, including static RAM and support for eight host channels, are priced at $30,000, plus $2,700 with a trade-in for each of the new channel adapters or $12,500 without a trade. The T-1 and E-1 scanners are each priced at $22,000.

Amdahl also recently announced its intention to support a full seven-layer Open

(continued on page 22)

Some vendors think standards are all you need to build an open network.

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3. How are you going to manage it all?

Network management standards are just beginning to appear. That's why integrated networks still remain elusive for many organizations. At BBN our network management system is based on an open architecture that supports both your old *and* your new systems. And it's OSI-compliant for the future.

4. Don't forget about next year's standards.

You'll face the same challenge every year – new standards will have to be incorporated into your existing network. BBN has plenty of experience in upgrading and maintaining networks over long periods of time. In fact we helped design and build the world's longest-running internetwork.

There's a lot more to consider in networking. That's why BBN has put together the "Networking Knowledge Series," a collection of interviews and articles from some of the leading experts in the communications industry. The series will give you valuable insights into the trends and issues that are shaping networking in the 1990s. To receive your free set, please call today.

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Circle Reader Service #143

Data Packets

continued from page 17

with the software are priced between $3,500 and $4,500, while the Codex 9800 software that supports the Split-T costs $2,995.

Kentrox Industries, Inc., located in Portland, Ore., recently unveiled microcomputer-based management software for its line of data service units (DSU) and channel service units (CSU) that are used to access fractional T-1, T-1 and T-3 circuits.

MultiSMART Manager runs as a Microsoft Corp. Windows application and manages a network of as many as 1,000 Kentrox devices, such as its T-SMART CSU, DataSMART T-1 DSU and DataSMART 45 DSU.

The product will be demonstrated at the International Communications Association's 44th Annual Conference and Exposition in Anaheim, Calif., this week.

DSUs or CSUs forward alarms to the management software before the hardware or circuit fails. Also, the software can upload hardware and circuit performance data stored on each DSU or CSU for central-site storage and reporting, and it enables users to configure remote DSUs or CSUs.

MultiSMART Manager includes a feature that allows users to group similarly configured DSUs or CSUs into specific domains. This feature lets users download a new configuration to each unit in the domain with a single command.

MultiSMART Manager supports an interface to AT&T's Accumaster Integrator integrated network management system and complements Kentrox's existing MultiSMART Supervisor, a microcomputer-based product with a menu-driven user interface.

MultiSMART Manager runs under DOS 4.1 on Intel Corp. 80386-based microcomputers equipped with at least 2M bytes of random-access memory or the recommended 4M bytes of RAM.

Currently in beta test, the package costs $4,950 and is scheduled to ship in the fourth quarter.

Network Resources Corp. (NRC), based in Milpitas, Calif., recently announced MacFTP, software that transfers files between Apple Computer, Inc. microcomputers and a range of Unix-based workstations on a Transmission Control Protocol/Internet Protocol network.

MacFTP software runs on Macintosh systems that also support Apple's MacTCP, a version of TCP/IP. Using MacFTP, which supports TCP/IP's File Transfer Protocol (FTP), users can conduct file transfers with Sun Microsystems, Inc. workstations, Digital Equipment Corp. Ultrix-based devices and other Unix-based servers and workstations.

MacFTP features a pop-up menu that lists all FTP servers available on the TCP/IP network. Simply by clicking on the server icon, the software sets up a file-transfer session with the target host. MacFTP allows a user to transfer multiple files, directories and Macintosh folders in batch form — a feature the company said is extremely useful for system backup procedures.

MacFTP requires 380K bytes of system memory and is fully compatible with Apple's new System 7.0 operating system. MacFTP is available now and costs $95 for a single-user license or $895 for a 10-user license. ◼

Study sees dim future for SNA, APPN

continued from page 17

was not its No. 1 purpose. "The main purpose of APPN is to bring the notion of full, dynamic peer-to-peer networking to SNA, and that's what it does," McGee said.

He noted that IBM does offer a facility that lets users carry Network Basic I/O System traffic across SNA or APPN networks using an LU 6.2 session. IBM is looking at alternatives for how to carry other LAN protocols, he added.

McGee said encapsulation techniques used by many router vendors today are only a short-term solution. He cited IBM's plan for a new routing protocol as a long-term goal. That approach would enable SNA nets to support multiple LAN or wide-area protocols over networks running at gigabit speeds, he said ("IBM modifying SNA," *NW*, Jan. 14). ◼

Amdahl boosts 4745 processor

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Systems Interconnection protocol stack under its UTS operating system. UTS is a Unix System V implementation for IBM System/370- and System/390-compatible mainframes.

OSI will join the Transmission Control Protocol/Internet Protocol and IBM's Systems Network Architecture as the third protocol stack supported under UTS.

Amdahl also plans to offer the OSI File Transfer, Access and Management (FTAM), X.400 message handling system and X.500 directory services software, all of which will run on top of its OSI stack.

The company plans to formally announce the products, including pricing, in the fall and said the OSI stack and FTAM software would be available in November. Amdahl's X.400 product is expected to be available in the second half of 1992, and no availability date was announced for the X.500 product. ◼

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Circle Reader Service #122

Worth Noting

> "A mini conjures up pictures of inflexible, proprietary and slow growth. [Superservers] are the socially acceptable minicomputers of the '90s."
>
> **Davis Fields**
> Director of marketing
> Parallan Computer, Inc.
> Mountain View, Calif.

Netnotes

Cisco Systems, Inc., of Menlo Park, Calif., announced last week that it has added a dial-up capability to its series of routers as a backup for a failed primary connection.

The capability allows Cisco routers to transmit data over a circuit-switched dial-up link at speeds up to T-1, enabling users to configure more reliable networks without requiring additional dedicated lines. The dial backup capability will be included as a standard feature of Cisco routers beginning in the third quarter.

FEL Computing, a division of FEL Industries, Inc., announced that IBM will resell FEL's LANlink-DECnet software package.

LANlink-DECnet connects IBM Personal Computers on IBM, Novell, Inc. and Banyan Systems, Inc. networks to Digital Equipment Corp. nets using DEC's Local Area Transport protocol. LANlink-DECnet supports Ethernet and token-ring networks and is available through IBM's Delivery Network Systems of the Services Sector Division in Charlotte, N.C.

David Systems, Inc. has reduced the prices of several of its local-area network products. The Sunnyvale, Calif., company has dropped the cost of its VolksNet Hub low-end 12-port Ethernet hub from $1,199 to $995. The five-slot Concentrator has been reduced in price from $1,200 to $900, while the 12-slot Concentrator's price dropped from $1,500 to $1,200. ☑

Phaser's NetWare for MVS pack gets mixed reviews

Some pleased, others less so with Phaser product.

By Eric Smalley
Senior Editor

Phaser Systems, Inc.'s NetWare for MVS, a software package designed to enable IBM mainframes to participate as servers in Novell, Inc. NetWare local-area networks, is receiving mixed reviews from users.

The package, released 14 months ago, has enabled some users to integrate their NetWare and IBM Systems Network Architecture environments, but has left others frustrated.

"We have several Novell networks in place and had been searching for a way to connect these networks through our SNA backbone network, particularly for software distribution," said David Culler, director of computer operations at Prudential LMI Commercial, the commercial insurance division of Prudential Property & Casualty Insurance Co.

"NetWare for MVS was one of the earlier products that offered that type of solution," Culler said. "To the extent we have implemented it, the product has performed as we anticipated and as it was purported to do. We're very pleased with the product."

While Culler and other users have been largely satisfied with the Phaser product, some users have had less positive experiences.

Not bug-free

"The product could be, in theory, very helpful to us," said Tom Hutton, systems analyst with the Center for Infectious Diseases of the Center for Disease Control (CDC) in Atlanta.

CDC installed NetWare for MVS 14 months ago but, due to bugs in the software, they were unable to use the product, according to Hutton. Phaser made changes in the last few months that finally enabled CDC to use part of the package, he said.

"They found some problems in some of their assembler routines," Hutton said. "They had written assembler code wrong. Some interrupts were being turned back on when they shouldn't be." The bugs in the software resulted in microcomputers locking up and the host application crashing frequently.

In addition to faulty code, Hutton said the product's performance was far below the level Phaser officials claimed. NetWare for MVS was purported to provide

(continued on page 27)

Wireless LAN technology extended to notepad CPUs

By Eric Smalley
Senior Editor

MOUNTAIN VIEW, Calif. — Proxim, Inc., an OEM supplier of spread-spectrum wireless local-area network products, last week announced a Novell, Inc.-compatible wireless LAN for the fledgling market of pen-based portable notepad computers.

The marriage of notepad computers and wireless LANs will allow microcomputer users to access files as they walk down the hall or update a data base as they stand over a patient's bed.

Proxim's product, ProxNet, uses a proprietary radio-based data-link layer protocol, according to Gordon Mayer, Proxim's vice-president of sales and marketing. "It fits right under the Novell [Internetwork Packet Exchange] stack," Mayer said.

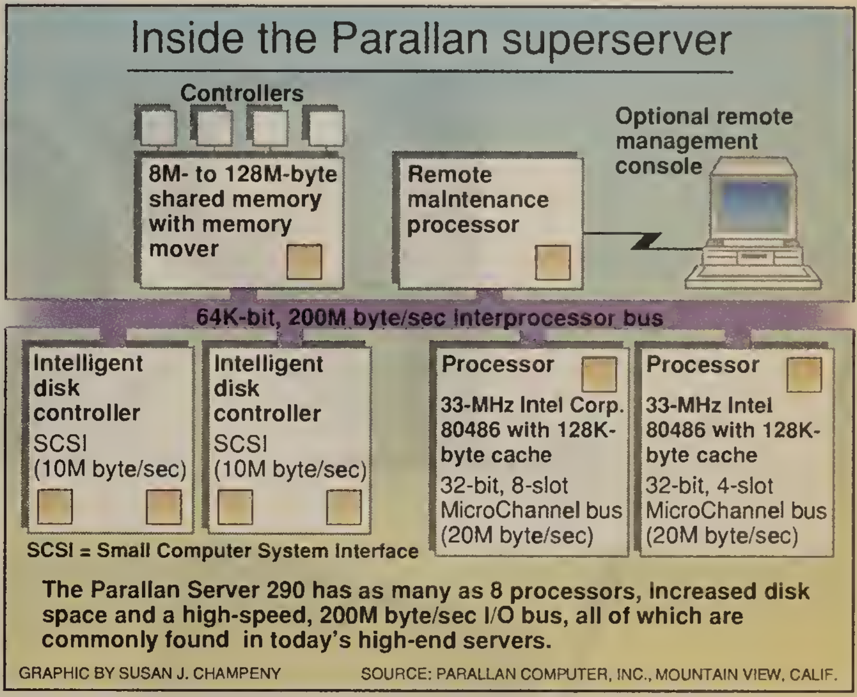
ProxNet includes communications modules that the notepad manufacturer builds into computers, a network interface card for a client or server node on an existing Novell network, and Novell software drivers.

Notepad nodes can be as far as 1,000 feet away from the Novell node with the ProxNet card, depending on the environment, according to Mayer. As many as 128 notepad nodes can reside on a single subnet, and more than one subnet can coexist in the same physical space without interference, he said.

Proxim offers different versions of ProxNet to OEM customers, depending on how much integration the customer is willing to perform, Mayer said.

ProxNet will add between $200 to $1,000 to the cost of each notepad computer depending on which OEM package the manufacturer buys and how much of a markup it charges.

Notepad manufacturers expect wireless LAN support to propel sales of their products, according to Mayer. ☑


Inside the Parallan superserver
Controllers
8M- to 128M-byte shared memory with memory mover
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Optional remote management console
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Intelligent disk controller
SCSI
(10M byte/sec)
Intelligent disk controller
SCSI
(10M byte/sec)
Processor
33-MHz Intel Corp. 80486 with 128K-byte cache
32-bit, 8-slot MicroChannel bus (20M byte/sec)
Processor
33-MHz Intel 80486 with 128K-byte cache
32-bit, 4-slot MicroChannel bus (20M byte/sec)
SCSI = Small Computer System Interface
The Parallan Server 290 has as many as 8 processors, increased disk space and a high-speed, 200M byte/sec I/O bus, all of which are commonly found in today's high-end servers.

GRAPHIC BY SUSAN J. CHAMPENY SOURCE: PARALLAN COMPUTER, INC., MOUNTAIN VIEW, CALIF.

Superservers: finding a home in user nets

Although still somewhat misunderstood, the new breed of servers is critical to some applications.

By Caryn Gillooly
Senior Editor

Superservers are answering many administrators' prayers as companies move critical applications to decentralized local-area network platforms. But there is still some uncertainty about what constitutes a superserver and how they can benefit users.

Companies define superservers differently, but all agree on the basic premise: Unlike personal computers that have been pressed into service as LAN servers, superservers are designed from the ground up with networking in mind.

"The amount of disk space on a [personal computer] is not enough when you've got lots of people on a network and the server needs heftier I/O than a [personal computer] has," said Davis Fields, director of marketing for Parallan Computer, Inc., a superserver maker in Mountain View, Calif. "You need larger disk capacity and multiple disk drives."

Superservers can typically store up to 20G bytes of information, compared to the average personal computer, which can only store about 500M bytes.

Superservers also differ from personal computers in that they have mainframe-comparable I/O buses running at speeds up to 200M bits/sec and can accommodate multiple processors, some housing as many as eight individual microprocessors. Personal computers, by comparison, cannot be scaled up to meet increasing power needs.

The companies that have entered the superserver market include Parallan, as well as Auspex Systems, Inc. of Santa Clara, Calif., Compaq Computer Corp. of Houston and NetFRAME Systems, Inc. of Milpitas, Calif.

Each company, however, is taking something of a different approach to the market.

Compaq, for example, comes in at the low end with its SystemPro line. These machines generally come with one processor and the capacity to add an additional processor, providing up to 256M bytes of 32-bit system memory. The SystemPro supports DOS, OS/2 and Unix, as well as LAN Manager, Novell, Inc.'s NetWare and Banyan Systems, Inc.'s VINES.

> Superservers also differ from PCs in that they can accommodate multiple processors.

▲▲▲

IBM also offers two low-end products — the Personal System/2 Models 90 and 95 — that have additional storage and disk space and an upgradable processor. These machines do not, however, accept additional processors; therefore, they cannot be considered true superservers.

Parallan is addressing the high end of the spectrum with its Server 290 family, which supports as many as eight processors and 28 Small Computer System Interface

(continued on page 26)

You know what happened to the PC, TV and VCR?

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Superservers finding a home

continued from page 23

devices. The Server 290 also has a 62-bit 200M byte/sec interprocessor bus, providing a high-speed data path between different subsystems in the machine (see chart, page 23). In addition, it supports DOS, OS/2 and Microsoft Corp. Windows clients, though it only supports the LAN Manager network operating system.

Most of the other vendors also offer high-end products for a variety of multiprocessing operating systems. Auspex sells a high-end product as well but only for the Unix market.

Just as different vendors are selling unique superservers, users are implementing superservers as solutions to various networking problems.

The Financial Guaranty Insurance Co. of New York is running its entire business off a SystemPro-based LAN running NetWare. The company downsized to the SystemPro from an IBM 4381 mainframe.

According to John Geyer, vice-president and director of systems at the company, the SystemPro has five servers — four SystemPros and one file server — each designated to support certain tasks.

The first server, he said, runs all the production applications that support the core business, such as data entry and accounting applications.

The second SystemPro is the firm's quality assurance server. "That server has a dual purpose," Geyer said. "It acts as a duplicate of the production server [for redundancy purposes] and, since it's a clone of the production server, we use it for last-stop testing for our internal developers."

The third SystemPro is the application development server, and the fourth is an image processing server.

Although the company enjoyed the power of the mainframe, internal developers could not write applications fast enough to meet Financial Guaranty's business needs, according to Geyer.

"The most important thing was to keep up with the rest of the business," he said. "And now we can implement emerging technologies such as image processing a lot faster and cheaper."

> The LAN has enabled Financial Guaranty to cut development costs from $10 million to $2 million.
>
> ▲▲▲

The SystemPros give Financial Guaranty the performance of a high-end machine and the ease of application development of a low-end machine.

Geyer said the LAN has enabled Financial Guaranty to cut development costs from $10 million to $2 million a year since 1988, while the staff has been cut from 70 to 20 people.

He also said he is not yet using the multiprocessing capability of the SystemPros because NetWare does not support it. But when the time comes, he will be able to get increased performance without changing the machines.

Cooperative Solutions, Inc., based in San Jose, Calif., uses a Parallan Server 290 to develop and test on-line transaction processing applications for client/server architectures.

According to Frank Clugage, director of product marketing at Cooperative Solutions, the company chose the Parallan Server 290 for its high performance, even though it has between 30 and 40 other servers.

"Since we're in the transaction processing arena, we need high performance," Clugage said. "The Parallan architecture was well suited for transaction processing. It's oriented to high-end performance and fault tolerance. The I/O architecture is very robust. It's similar to the architecture of a mainframe or mini." ◘

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Circle Reader Service #115

Backup pack enhanced to support TCP/IP networks

By Eric Smalley
Senior Editor

EDEN PRAIRIE, Minn. — Software Moguls, Inc. has enhanced its backup and archiving software for Unix systems to enable users to back up and restore files on remote nodes across networks based on the Transmission Control Protocol/Internet Protocol.

SM-arch Version 2.0, based on a client/server architecture, can be used to back up DOS-, IBM OS/2-, Apple Computer Corp. Macintosh-, Digital Equipment Corp. VMS- and Unix-based client systems using a TCP/IP sockets-based protocol, according to Sunil Khadilkar, the firm's vice-president of software development.

The SM-arch server software runs on Unix systems and performs mainframe-like data management tasks such as backup and archiving. The client software converts the directory information of files on non-Unix systems to a Unix file format before backing the files up to tape or optical storage devices. SM-arch also maintains a directory of all backups performed.

SM-arch server software is available for IBM RISC System/6000, Sun Microsystems, Inc. SPARCstation, and Intel Corp. 80386- and 80486-based Unix systems. The server software costs $4,000. The client software costs $500 but is not required if the network supports the Network File System. ◼

Phaser pack gets mixed reviews

continued from page 23

a throughput rate of 25K to 30K byte/sec. "We're seeing about 10% of that," Hutton said.

The physical connection between CDC's mainframe and 16M-bit token-ring backbone is a channel-attached dedicated controller.

By contrast, Ohio Edison Co. has had NetWare for MVS for 10 months and has not run into any major problems.

"We use it every day to upload and download files to the mainframe," said Bob Humes, senior technical analyst for Ohio Edison. "I haven't had any problems with it lately."

One of the problems Humes encountered occurred when multiple files were transferred across the gateway at one time. "We did get some file corruption," he said. "Phaser has rewritten the module but I don't know if it works."

Hard to fully test

Bill Ferguson, Phaser's vice-president of marketing, explained that the different experiences of his company's customers are a result of their different network environments.

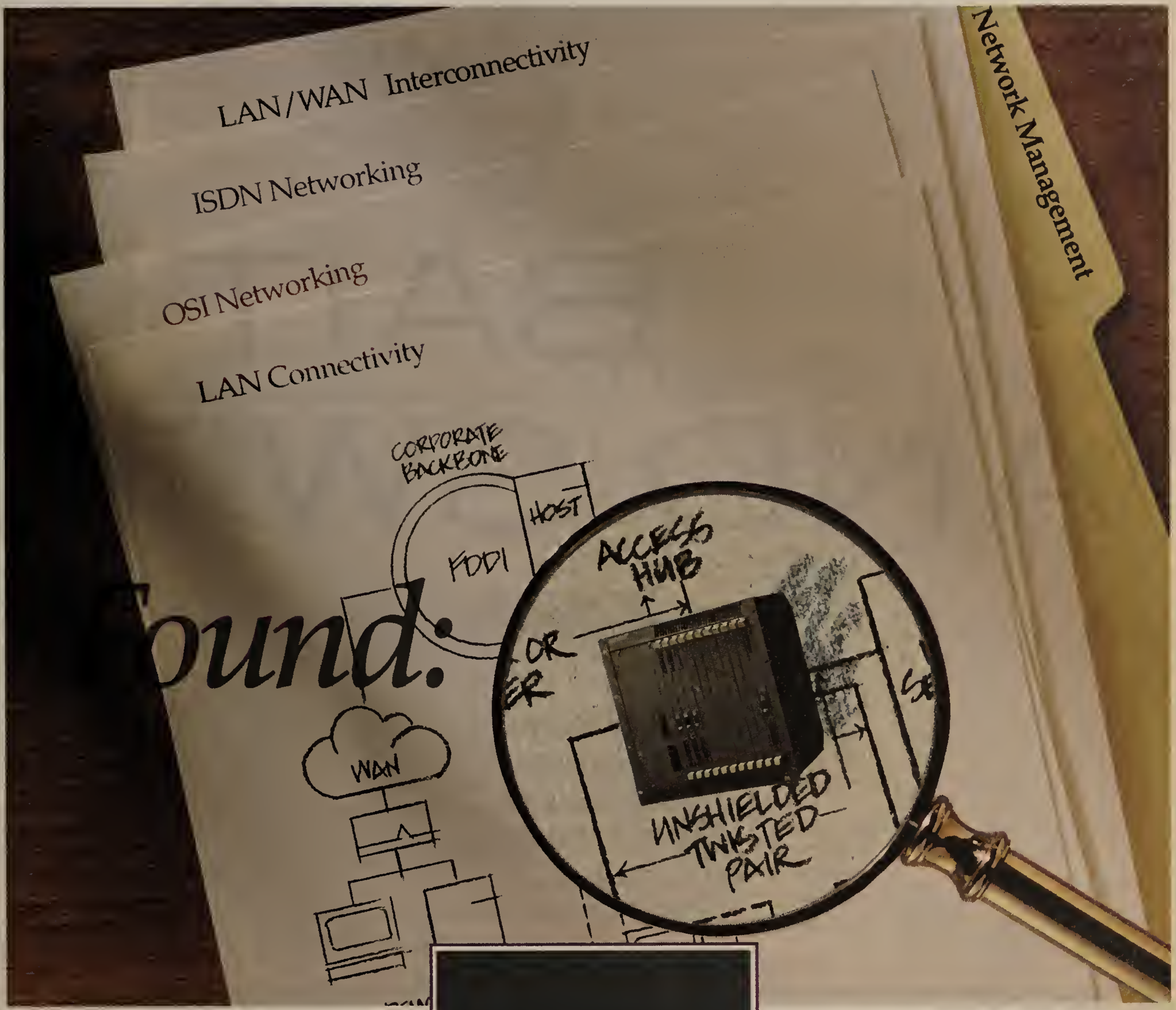
"The product is used in a variety of permutations of hardware and software that you can never fully test in your labs," he said.

One area of concern for many users, including some who are satisfied with NetWare for MVS, is the level of service and support offered by Phaser. "I would not give them real high marks [for service]," Prudential's Culler said. "At times, I have had to raise the roof to get service."

CDC's Hutton concurred. "I wasn't able to get them to do anything until I got really angry a couple of months ago," he recalled. "Depending on what happens in the next 30 days, if it doesn't get straightened out, I'm going to ship the product back."

Ohio Edison's Humes has had better luck. He said he has found Phaser to be reasonably responsive and provide better service than most software companies.

Phaser's Ferguson said the company has recently undergone a reorganization of its service and support group. He also noted that it takes time for a young company to establish a lab capable of replicating the problems customers may encounter. ◼



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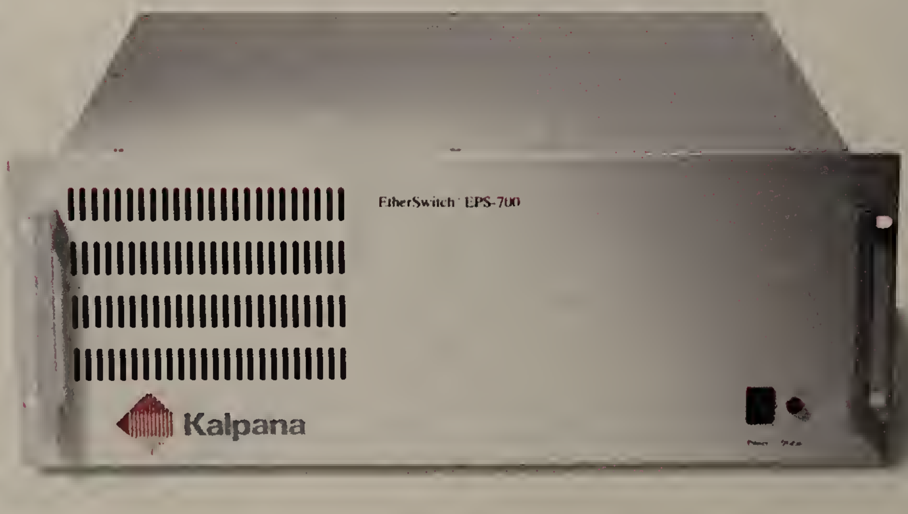

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MANAGING PEOPLE AND TECHNOLOGY: USER GROUPS AND ASSOCIATIONS

Dialogue

What effect do you think AT&T's acquisition of NCR Corp. will have on users?

"We've been seeing a lot of interesting improvements coming out of AT&T's computer division during the past year. The acquisition of NCR seems to indicate that we'll see even further improvements.

"We're a very large AT&T communications customer and, to some degree, an AT&T hardware customer. If this merger accelerates the trend we're seeing of better hardware and software tools coming out of AT&T, we'd be very pleased."

Ira Morrow
Vice-president of technical planning
Shearson Lehman Brothers, Inc.
New York

"I don't expect users will feel any effect during the next 12 months. But in the next two to three years, we should see some integration of products. As a customer of both NCR and AT&T, I'm optimistic, but I'm also taking a wait-and-see attitude.

"I think they make a good match, and both companies should be able to play off each others' strengths if they manage it well. But if they don't, it'll be another IBM/Rolm [Co.] deal. The communications and computer worlds are merging, so to that extent, I think it's a good idea. Whether they hit the mark though remains to be seen."

Fred Harde
Senior data processing officer
The Riggs National Bank of Washington, D.C.

"I don't see AT&T as a serious contender in the computer arena, even with the acquisition of NCR. AT&T is too big and there's too much infrastructure in place to enable them to respond rapidly to changes in the market. You need to make decisions very quickly to be successful in the networking field, and my perception is that AT&T can't do that.

"AT&T might be successful if they do something similar to what IBM did when they first introduced the personal computer; that is, spin it off to another division, give them a

(continued on page 31)

Wireless monitor system helps shorthanded hospital

New technology keeps tabs on multiple patients.

By Maureen Molloy
Staff Writer

BOSTON — To help cope with a severe shortage of nurses and limited intensive care space, Franciscan Children's Hospital (FCH) here has installed a new wireless patient monitoring system that enables the hospital to keep tabs on a number of patients from a single nursing station.

The hospital is one of the first users of the Escort-Link wireless bedside monitoring system released this spring by Medical Data Electronics, Inc. of Arleta, Calif.

Stewart Kagel, respiratory director at FCH, said the portable communications system has proven invaluable because it helps the hospital provide quality health care without adding staff and requires no complicated wiring installation.

"Our staff searched two years for a monitoring system with the right functionality, and we finally found it," Kagel said. "It's hard to imagine how we operated this long without it."

Kagel was searching for a system that would address several problems facing FCH. The first was how to care for acutely ill infants who require constant attention at a time when the hospital was dealing with a shortage of nursing professionals. The second dealt with minimizing costs during the hospital's major renovation.

"We needed a system that could fill the gap left by missing nurses," Kagel said. "And because we'll be completely renovating the hospital, we didn't want to sustain major wire installation expenses for a system that will likely be moved to another unit."

The Escort-Link central display station receives 460-MHz radio frequency signals every two seconds from as many as 32 bedside monitors. Unlike other patient monitoring devices that record a patient's electrocardiogram (ECG), the Escort-Link monitors and displays multiple physiological parameters, including ECG, invasive and noninvasive blood pressure, respirations, oxygen saturation and temperature.

A waveform of a patient's parameters is displayed on the central station video screen in a configuration that illustrates potential danger. Continuous waveforms from eight patients — as well as less detailed infor-

(continued on page 32)

BOOK REVIEW

BY ERIC SCHMALL

A road map for the brave new world of LANs

LAN Operations, A Guide to Daily Management, Peter Rhodes (Reading, Mass.: Addison-Wesley, 1991), $39.75.

Few topics in telecommunications today are as captivating as those dealing with local-area networks and their effective management. For anyone who is establishing LANs and wants to successfully deploy and manage this technology, Peter Rhodes' book will provide significant help. Rhodes offers a comprehensive review of the issues that prospective LAN managers must face. No one who reads this book should ever have the excuse of saying, "Gee, I never anticipated that."

An experienced LAN manager may find some of the reading to be filled with reflections that do nothing but state the obvious. Even so, Rhodes has packed in so much meticulous detail in his review of LAN management that even the hard-bitten LAN professional may derive some benefit from the author's well-organized approach.

With careful attention to detail, the author covers a myriad of daily management issues. He deals with accounting for LAN assets and chargeback methodologies. He explores the issues surrounding configuration management, fault isolation/resolution, performance measurement, security, management reports and standards. And he even addresses personnel issues such as

(continued on page 30)

Anatomy of an LBO gone sour

West Point-Pepperell, Inc.'s roller coaster ride through the junk bond era.

Nov. 1988	Financier William Farley begins hostile takeover bid for WPP with junk bond financing from Drexel Burnham Lambert, Inc.
Feb. 1989	Farley purchases WPP for $1.6 billion, or $58 per share.
April 1989	Decline in junk bond market prevents Farley from purchasing all of WPP's stock. Without full ownership, Farley can't use WPP's profits to pay off short-term debt.
Feb. 1990	Drexel Burnham files for bankruptcy following collapse of the junk bond market. Banks press Farley to repay almost $1 billion in debt.
March 1990	Farley sells Cluett, Peabody & Company, Inc., a division of WPP and maker of Arrow shirts, for rock-bottom price of $350 million.
Jan. 1991	With Farley now almost $2 billion in debt and behind on interest payments, WPP stock price falls to low of $20^{5}/_{8}$.
April 1991	Banks begin discussing whether to hand over WPP to Farley's creditors.

GRAPHIC BY SUSAN J. CHAMPENY

A manager's journey through tough times

How Bill Gladden survived a turbulent corporate takeover that shook up West Point-Pepperell.

By Wayne Eckerson
Senior Editor

WEST POINT, Ga. — On Feb. 23, 1989, two significant things happened to Bill Gladden, manager of telecommunications at West Point-Pepperell, Inc. (WPP): He turned 37 and William Farley purchased WPP.

While Gladden celebrated his birthday, he greeted the news of Farley's successful $1.6 billion hostile takeover of the family-run textile company with apprehension.

Gladden spent the next two years trying to make the best of a situation many network managers hope they never have to face — surviving a hostile and divisive corporate takeover.

Farley, a Chicago financier, had earned a reputation for using junk bond financing to purchase large companies and then break them up. He believed in running divisions as independent business units and shrinking the size of corporate headquarters operations to reduce overhead.

All that spelled trouble for Gladden, whose six-person corporate telecommunications department had a $5 million budget and managed the voice and data networks for WPP's various operating companies, including J.P. Stevens & Company, Inc., a New York manufacturer of bed and bath products, and Cluett, Peabody & Company, Inc., the maker of Arrow and Burberry shirts.

"We were afraid he was going to dissolve the corporate division, including telecommunications, and farm out all operations to the business units," Gladden said. "We were very stressed [by the deal]. We never knew when someone was going to walk into our offices and dismiss us."

Moreover, Gladden knew that Farley, who had taken on nearly $3 billion in debt from bank loans and junk bonds, would start chopping away at major budget items, such as telecommunications, in an effort to reduce costs.

Bill Gladden

"I thought they would eliminate my position and let the analysts and clerks handle the work load," Gladden said.

To demonstrate the value of his department to the company, Gladden wrote several reports showing the cost savings from the

(continued on page 30)

A manager's journey through tough times

continued from page 29

network projects and procedures he had spearheaded during the past four years.

He also began looking for new ways to cut costs. One way was to purchase used private branch exchanges instead of buying new ones. For example, Gladden said he saved WPP $33,000 by purchasing an AT&T Definity 75 on the secondary market and using spare parts from his own inventory to get it running.

In addition, Gladden signed a three-year multimillion-dollar deal with AT&T for virtual network services shortly before the leveraged buyout took place. That deal has not only trimmed WPP's telephone bill by several hundred thousand dollars annually, but has also given the company the flexibility to add and subtract business units without reconfiguring an electronic tandem network with new circuits and hubs, a costly and time-consuming process.

Evidently, these efforts paid off. While Farley made deep cuts in corporate staff that summer, Gladden and his group were spared — much to his surprise.

Farley, on the other hand, was running into trouble. With the decline of the junk bond market, he was unable to raise enough money to complete the WPP transaction and found himself falling behind in payments to New York banks, which lent him $1.2 billion in bridge loans (see graphic, page 29).

Farley's difficulties only added to the uneasiness and low morale among WPP staffers, Gladden said. Gladden, like most WPP corporate staffers, began polishing up his resume and putting out feelers for other jobs.

"I didn't have a warm, fuzzy feeling that the company would be around for another 10 years," Gladden said.

Also, as capital and operating budgets became tighter, it became less satisfying to work at WPP, he added.

Moreover, having risen to the top of the network ladder, Gladden saw no place for advancement. "I was the top telecom guy," he said.

Unfortunately, Gladden discovered that there were no other network jobs of his level or higher at any companies within 75 miles of West Point, a rural town on the Georgia-Alabama border. Gladden said he was willing to relocate anywhere in the Southeast, although he and his family preferred to continue living in West Point.

The ICA connection

Gladden contacted recruiters and acquaintances he had met through the International Communications Association (ICA), where he served on the annual program committee for four years. While these calls didn't generate any solid job leads, Gladden said talking with his peers in the ICA gave him much needed support and encouragement.

"If I could give any advice, it would be to network with your peers through a professional organization such as the ICA," Gladden said.

This winter, Gladden accepted an offer to serve as vice-president of administration at a local savings and loan institution where he is on the board of directors.

> "I didn't have a warm, fuzzy feeling that the company would be around for another 10 years," Gladden said.
>
> ▲▲▲

While the savings and loan position enables him to remain in West Point, Gladden said he regrets cutting his ties with his colleagues in the networking field.

"One of the toughest parts of the decision was leaving behind the ICA and all the friends I made as a member," Gladden said.

Gladden has not yet been replaced at WPP and probably won't be, according to colleagues with whom he has kept in contact. Without a network manager to monitor the billing, reconfigure the network as circuit prices fluctuate and replace aging PBXs, it will be tough for WPP to run a cost-effective network operation, he said. ◘

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A road map for the new world of LANs

continued from page 29

recruitment, training and turnover.

Despite its strengths, the book has some flaws. Rhodes neglects to provide certain additional information critical to LAN management. For instance, although he discusses certain types of diagnostic equipment essential for LAN management, he does not list the major manufacturers, how much the devices cost or where to get additional information. Rhodes also never explains the role of the LAN manager in the modern organization. He neglects to show to whom the LAN manager typically reports or with whom the LAN manager may need to work on a regular basis.

However, all in all, Rhodes provides a thorough review of the elements involved in managing LANs, and his book would be valuable to any newcomer to this challenging and emerging field. ◘

GUIDELINES

BY BRUCE ELBERT

Planning key to net success

Today, network managers are contending with increasing demands from end users and business unit executives for new and more sophisticated networking capabilities.

But net managers should not rush into implementing new applications and network equipment.

Lack of careful planning cannot only torpedo a net project, but it can also lead to problems that can cause irreparable damage to the network department's credibility and unnecessarily shorten a net manager's career.

Often, network managers fall prey to the less than adequate planning of others, usually business unit managers who have no clear idea of the capabilities new technologies can offer or who have been convinced by a vendor that they need new equipment.

Whether the network manager is directly responsible for a new network initiative, the risks are still the same. Net managers need to be actively involved in planning for all network projects to ensure that proper guidelines are followed and key requirements are met. In one company, for example, a business unit manager wanted to replace an antiquated message broadcast system with an interactive electronic mail system based on what he thought was a standard network platform.

While the manager gained the tacit approval of corporate data processing and used a very respected vendor, he failed to clearly specify requirements for the new E-mail system. After many months of effort, the vendor finally admitted that its product probably would not work in the existing systems environment.

Fortunately, the company assigned an experienced network manager to salvage the E-mail project. The network manager put the project back on proper footing by simply tying down requirements and managing the vendor properly.

Such catastrophes can easily be averted if network managers follow a few simple guidelines and stay abreast of all network initiatives being considered by users.

Consider the following before making a commitment to a major network project:

- **Identify network requirements and segregate them in terms of needs and wants.** This requires meeting frequently with users in an open, cooperative environment. Network managers need to define specifications based on users' needs, not

(continued on page 32)

Elbert is director of operations for a large communications company and author of several books on telecommunications and information technology.

Dialogue

continued from page 29

high degree of autonomy and let them fly as a small, independent division with the financial resources of the parent company. But I'm not convinced [that] AT&T could make a gutsy move like that."

Greg Scott
Computing services manager
College of Business
Oregon State University
Corvallis

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Chuck Papageorgiou
Network administrator
United Parcel Service, Inc.
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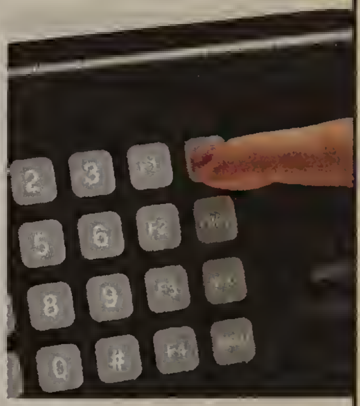

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Monitor system helps hospital

continued from page 29

mation on 24 other patients — can also be displayed.

The system is programmed with alarms and cautionary messages to immediately alert hospital staff to any changes in a patient's condition. For instance, if an infant's respiration falls below a certain level — one configured by the user — an alarm sounds at the central station and the screen indicates which patient in which room needs assistance.

"In our old hard-wired system, an alarm would go off but we would have no idea which patient needed help or where that patient was located," Kagel said. "This system is more secure and allows us to respond more immediately to a patient's needs. Since we specialize in caring for infants with severe respiratory problems, the benefit can't be overemphasized."

Kagel said another major benefit of the system is that it gives the patient greater autonomy and mobility. Patients are programmed at the central station to a particular monitor that remains with them throughout their hospital stay. This allows them to be under constant surveillance because the monitor — which is about the size of a shoe box and can cover the 70,000-sq.-ft. range of a typical hospital wing — is easily carried to wherever the patient is moved.

The hard-wired system was much less flexible, he said, because it required wiring a monitor to a particular bed. As a result, each time patients were moved, they had to be reprogrammed into a new monitor.

"Patients are frequently moved here because of constant fluctuations in patient levels," Kagel said. "The wireless system addresses our need for flexibility and requires much less reprogramming at the central station."

He added that the wireless network technology provides a better price/performance ratio because the cost to install the system was less than half the price of a hard-wired installation.

Kagel said the Escort-Link has an archiving feature that permits storage of patient information. That's been an added boon to other hospital staff, such as researchers and therapists.

The system can record and store all patient information obtained from the central station. Because the central display station hardware is a personal computer-compatible device, all archived information can later be downloaded to other hospital information systems.

Boston's Franciscan Children's Hospital

"We didn't initially demand an archiving function, but it's become a valuable feature of a system we could never do without," Kagel said. "The wireless system and central station is the same as having a staff member stationed in each patient's room."

Planning key to net success

continued from page 31

wants. It's sometimes difficult for users to differentiate between the two.

It takes considerable patience and solid communication skills on the part of the network manager to help users identify their needs vs. wants. However, without clearly defining users' requirements, net managers cannot confidently qualify vendors or their systems.

■ **Investigate options.** Besides exploring new systems and products being offered by vendors, net managers should not overlook their existing network resources. Often, there are many cost-effective ways to improve performance or add capabilities without replacing a system or adding costly new software or hardware.

For example, a new private branch exchange may not be required if your existing PBX can be upgraded by changing the processor and adding memory and software. Move to a new platform only if the requirements overwhelmingly favor it or if your existing network is completely obsolete or incapable of supporting those requirements.

■ **Identify associated risks.** Each option has its advantages and risks, which must be looked at together. Good network managers weigh the risks involved in each option against the organization's requirements for network services.

If a business is totally reliant on network services in order to carry transaction information and interact with customers, such as brokerages and banks, then net managers will want to choose options with the smallest inherent risk.

■ **Anticipate long-term requirements and costs.** For the typical project, this may be a long list, so recruit your brightest employees to identify the additional requirements, such as maintenance costs, depreciation rates, reliability and licensing agreements.

Factoring in these requirements over the expected life of the new product will help net managers avoid costly and career-threatening mistakes.

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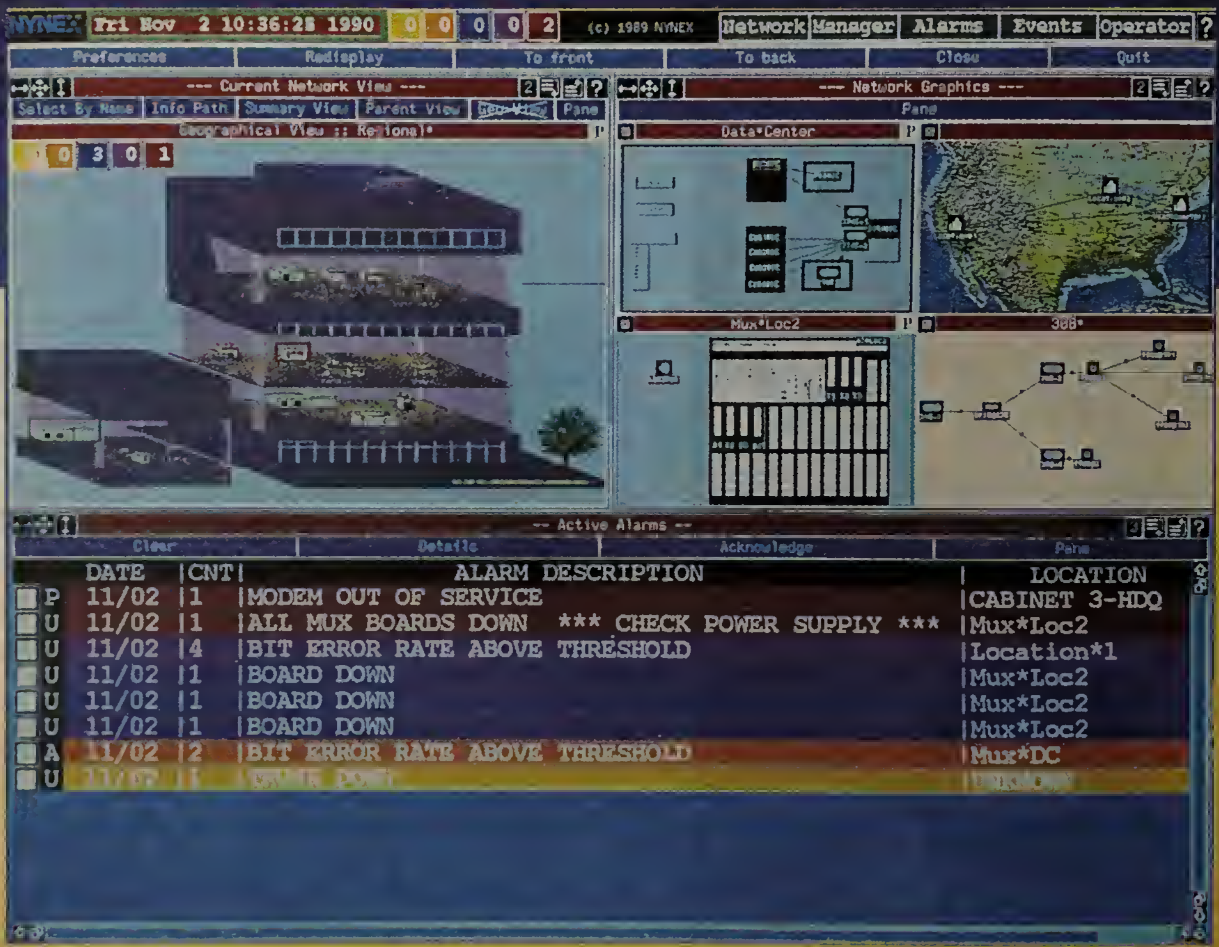

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  DATE  |CNT|              ALARM DESCRIPTION                |   LOCATION
P 11/02 |1  |MODEM OUT OF SERVICE                           |CABINET 3-HDQ
U 11/02 |1  |ALL MUX BOARDS DOWN   *** CHECK POWER SUPPLY *** |Mux*Loc2
U 11/02 |4  |BIT ERROR RATE ABOVE THRESHOLD                 |Location*1
U 11/02 |1  |BOARD DOWN                                     |Mux*Loc2
U 11/02 |1  |BOARD DOWN                                     |Mux*Loc2
U 11/02 |1  |BOARD DOWN                                     |Mux*Loc2
A 11/02 |2  |BIT ERROR RATE ABOVE THRESHOLD                 |Mux*DC
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World News

The Puerto Rican government's latest bid to privatize its monopoly telephone company fell apart recently, representing the biggest setback in recent efforts by countries worldwide to sell state-owned carriers.

Puerto Rico's legislature had authorized the sale of its state-owned carrier in April 1990, with legislation that made the sale contingent upon the government receiving $2 billion in proceeds and the purchaser assuming $1 billion of debt. BellSouth Corp. was among several bidders.

However, the bids came in well short of the asking price. Stipulations by the government barring cost-cutting or revenue-raising measures apparently had an adverse impact on the sale.

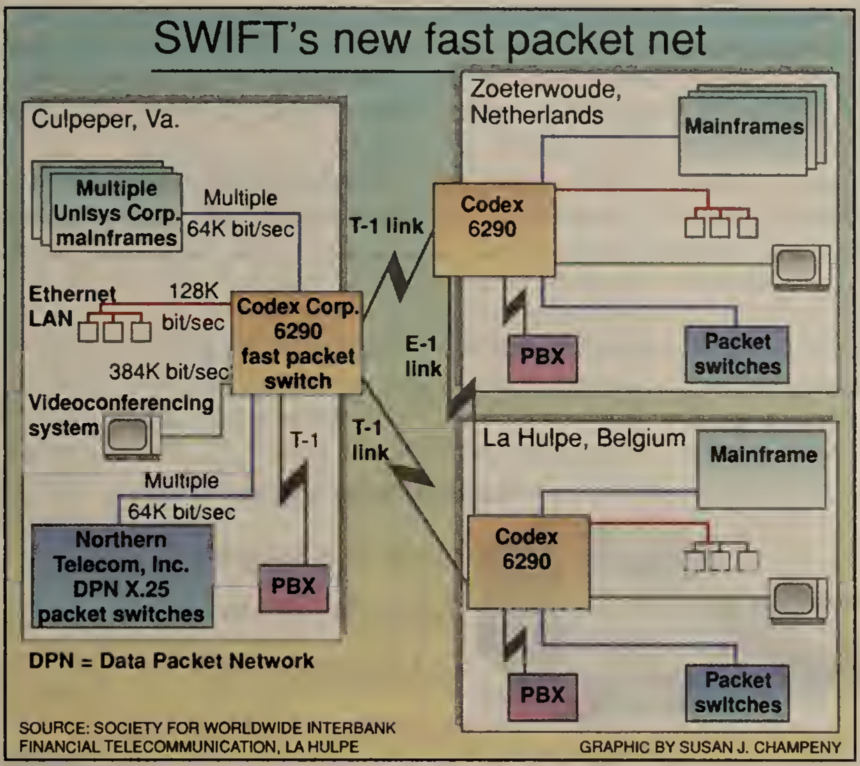
Other countries that have recently privatized carriers include Argentina, Mexico and New Zealand. Australia and Malaysia are currently seeking purchasers for state-owned carriers, as are several Eastern European countries.

Telesat Canada recently said it plans to file a $240 million insurance claim as compensation for the failure of its recently launched Anik E2 satellite.

The Anik E2 satellite was supposed to greatly expand Telesat Canada's satellite coverage of the U.S. The satellite was successfully launched in April, but was later unable to deploy one of its two antennas.

According to Telesat Cana-

(continued on page 36)



SOURCE: SOCIETY FOR WORLDWIDE INTERBANK FINANCIAL TELECOMMUNICATION, LA HULPE

GRAPHIC BY SUSAN J. CHAMPENY

SWIFT's new T-1/E-1 links to support fast-packet net

Upgrade necessary to handle increased traffic.

By Bob Brown
Senior Editor

LA HULPE, Belgium — The Society for Worldwide Interbank Financial Telecommunication (SWIFT) said recently it will upgrade its backbone network by replacing multiple 64K bit/sec lines with T-1/European T-1 links supporting fast-packet switching.

SWIFT, an international bank net based here that transports messages used to initiate most of the world's international funds transfers, will save some $2 million a year by replacing about 40 64K bit/sec links with three T-1/E-1 links. The T-1/E-1 links will be used to support the growing volume of voice, data and video traffic between SWIFT's main data centers in Culpeper, Va., Zoeterwoude, the Netherlands, and backup facilities here.

By installing Codex Corp. 6290 fast-packet switches at the three data centers, SWIFT will be able to prioritize traffic to use capacity on its T-1/E-1 links more efficiently.

The Codex switches, which are made by StrataCom, Inc. of Campbell, Calif., will support Unisys Corp. A-Series mainframes, Northern Telecom, Inc. packet switches, Ethernet local-area networks and videoconferencing gear in the data centers.

The network upgrade follows SWIFT's cutover last year of SWIFT2, a packet-switching network that replaced the original SWIFT network cutover in 1977 ("SWIFT2 completion adds needed capacity," *NW,* Sept. 17, 1990). The SWIFT2 network can handle 1.5 million messages daily.

That network links about 3,000 banks and other financial institutions worldwide via about 70 regional nodes that feed into the three data centers. SWIFT is in the second phase of installing

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OSITOP offers tips to gain OSI support

Exec says European net managers build business cases to win management's blessing for OSI nets.

By Ellen Messmer
Washington Correspondent

VANCOUVER — European network managers are building strong business cases to win executive-level support for Open Systems Interconnection plans, according to an official from Europe's top OSI users group.

Renaan Barzal, chairman of the Paris-based OSITOP group and internal consultant for strategic planning at Banque Nationale de Paris (BNP), told attendees at a recent conference here that European net managers are increasingly basing their OSI implementation plans on specific intercompany business needs in order to get backing for the projects.

Speaking at the North American Open Systems Conference, Barzal updated attendees on OSITOP's Business Communications Project.

The goal of the project, launched last November, is the implementation of OSI-based systems between OSITOP user members across Europe ("European firms unite in effort to construct OSI nets," *NW,* Feb. 18).

OSITOP, comprising 125 user and vendor members, limits vendor membership to one-quarter of the group's total.

Currently, 13 OSITOP user members are actively participating in the Business Communications Project, Barzal said (see chart, page 36).

Since the project's concep-

(continued on page 36)

BR Telecom sees success in U.K. around the bend

IDG News Service

LONDON — As the U.K. moves to open its domestic network market to full competition, British Rail (BR) Telecom, the networking arm of British Rail, has emerged as one of the leading contenders to become the country's third major carrier.

But while BR Telecom chugs along toward this goal, it is facing fundamental questions about its viability. For starters, what makes a company that specializes in a 19th century technology believe it can sell the premier business technology of the 21st century?

In a recent interview, Peter Borer, managing director of BR Telecom, scoffed at such concerns. He said British Rail has a long history as a telecommunications operator, which will help vault it toward success in a competitive market.

"We're about the same size Mercury Communications [Ltd.] was a couple of years ago," Borer said.

Officially formed last September, BR Telecom operates about 60,000 private circuits that for years have supported British Rail's internal operations.

(continued on page 37)

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World News

continued from page 35

da, the satellite cannot function without both antennas.

In the fiscal year ended March 31, **British Telecommunications PLC** said cost cutting caused pretax profit to increase 14.2%, to 3.1 billion pounds sterling ($5.7 billion U.S.) on revenues of 13 billion pounds sterling ($23.9 billion U.S.).

In the same period, Japan's **Nippon Telegraph and Telephone Corp.** said sharper competition contributed to a drop in consolidated net profit of 14%, to 236.03 billion yen ($1.71 billion U.S.) on revenues of 6.25 trillion yen ($45.3 billion U.S.). ☐

OSITOP tips to gain support

continued from page 35

tion, OSITOP members have decided that natural business incentives between partners would be the optimum driving force to gain the necessary attention and financial support to implement the desired network changes.

OSITOP membership decided that the initial OSI projects would have to focus on pairing companies to implement X.400, X.500, File, Transfer Access and Management (FTAM), electronic data interchange or other standards-based means of information exchange.

Each pair of companies will have strong business incentives to improve both the intercompany communications between them and the means of communication with their end-user customers, Barzal said.

Business needs, such as the wish to eliminate the documents currently faxed or mailed between two companies, will shape the future implementations, he added.

"Intercompany — that's how we'll manage to bring in OSI," Barzal said. "What we want to implement is not a demonstration, but a business scenario."

For instance, BNP may partner with Dresdner Bank AG on an OSI project in the future, although Barzal said no decision to that effect has been finalized.

OSITOP's Business Communications Project participants

- Banque Nationale de Paris, Paris
- BASF, AG, Ludwigshafen, Germany
- Bayer, AG, Bayerwerk, Germany
- Credit Lyonnais, Paris
- Daimler-Benz AG, Stuttgart, Germany
- Dresdner Bank AG, Frankfurt, Germany
- Electricite de France, Paris
- Hoechst, AG, Frankfurt
- Iberduero S.A., Bilbao, Spain
- Imperial Chemical Industries, PLC, London
- Nestle, S.A., Vevey, Switzerland
- Saint Gobain, Paris
- Scandinavian Airlines Data, Copenhagen, Denmark

SOURCE: OSITOP, PARIS
GRAPHIC BY SUSAN J. CHAMPENY

As the group sat down last February to begin drawing up plans, it became apparent that more than just the idea of interoperability would be needed to drive the group's work, Barzal said.

"It's difficult to convince anybody — let alone a CEO — to change," he said. It would take a strong business case for OSI to convince management at the participating corporations to fund new projects, Barzal emphasized.

Ironing out plans

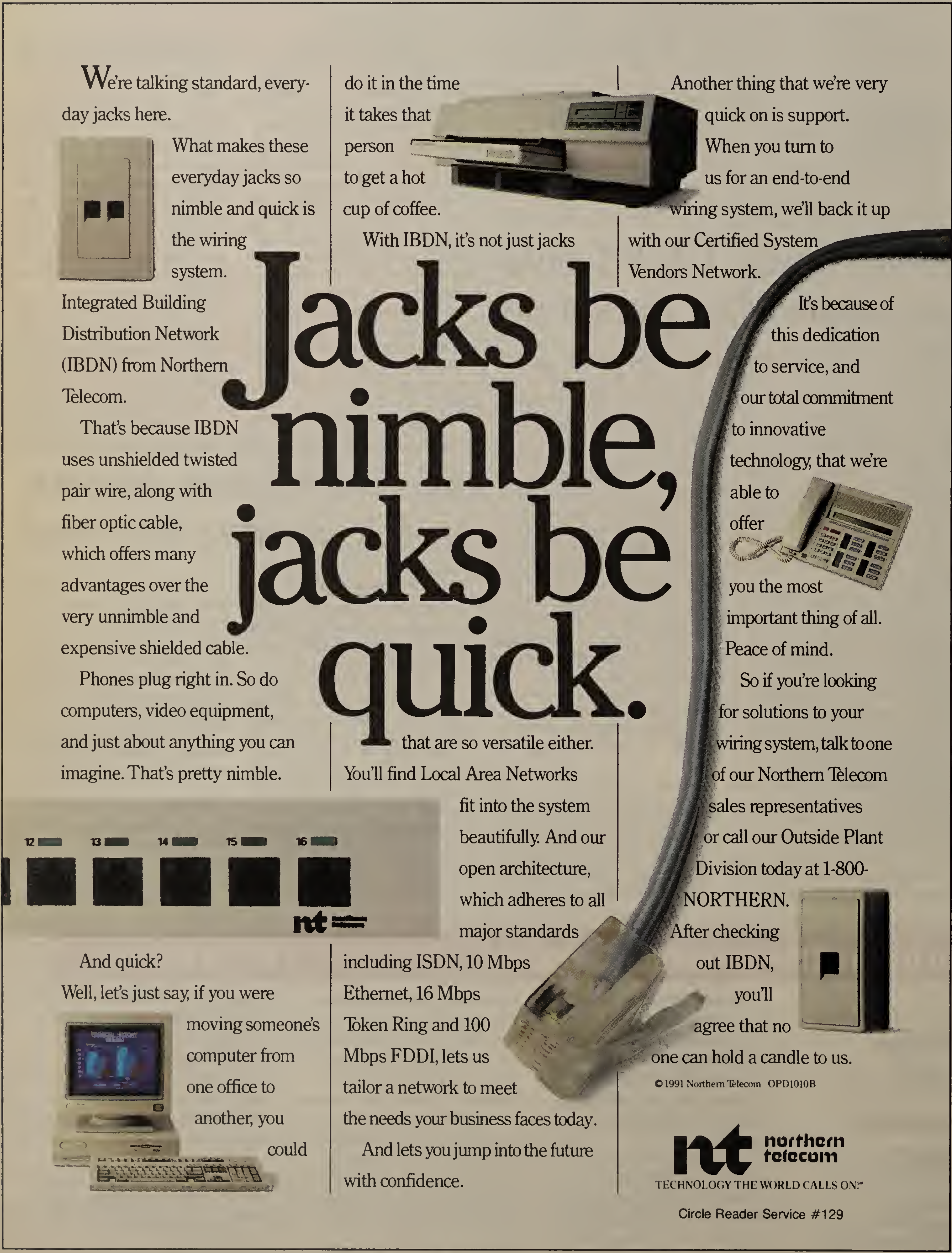
The various ideas now being floated are expected to be adopted as implementation plans by year end, Barzal said. At that point, users will have to invest the funds necessary for the task, although support from the European Community may come yet, he added.

Another hurdle the group must address is support for existing systems.

"We'll have to tackle the migration issue," Barzal said, noting that open systems will have to be integrated with existing systems, such as BNP's IBM Systems Network Architecture network.

"We'll have to share experiences or we'll end up reinventing the wheel," he said.

As an end result, Barzal said, "We hope to have systems corresponding to real business needs." ☐



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BR Telecom foresees U.K. success

continued from page 35

Borer said BR Telecom is ready to jump into the mainstream and sell network services to other users as soon as the company can find a suitable business partner. BR Telecom is looking for a solid, privately owned carrier with lots of money and marketing expertise to share.

"They've got to be pretty substantial companies," Borer said. "We're talking about hundreds of millions of dollars" to launch BR Telecom as a full-service carrier.

But it's the marketing as much as the money that BR Telecom covets. Until now, BR Telecom has had only one customer, British Rail, so selling telecommunications services to the rest of the U.K. will not be easy.

Building a new image

That brings up BR Telecom's largest obstacle: British Rail. Is any other U.K. organization as much maligned in the public eye as BR Telecom's parent? Right or wrong, British Rail always seems to be struggling against bad press, which could make it difficult for BR Telecom to sell its services.

Borer admits that British Rail's image is a problem for BR Telecom but said he believes that proper marketing will help BR Telecom overcom the issue. "Some people are always going to knock us, but [establishing a] good [brand name] can change the customer perception of what you are trying to sell," he said.

Borer is keen to point out that it's not just his firm that is fighting history: British Telecommunications, PLC is also spending millions of dollars on a new logo in an attempt to improve its public image.

"They've still got some of the hang-ups from when they were state-owned," he said.

Borer speaks from personal experience. Before moving to BR Telecom in 1989, he worked with Kingston Communications, a U.K. carrier serving the city of Hull, England, and, for the moment, the only carrier operating independently of British Telecom and Mercury.

Kingston began 80 years ago as a telephone service owned by the city council, a common practice then. But while most city-run services eventually sold out to the British Post Office, Kingston remained independent.

The five years Borer worked at Kingston gave him firsthand experience of what it's like to compete against British Telecom. His conclusion is that sometimes it is better to be smaller.

Borer's point is that small companies are often better placed than larger firms to take advantage of changing market conditions such as skyrocketing demand for data communications.

"[Data communications] growth seems to be insatiable, even within British Rail," Borer said. "British Telecom's weakness is that it has difficulty in moving quickly in an entrepreneurial way to take advantage of this."

But isn't Mercury small, too? Borer agrees but points out that Mercury serves limited areas of the U.K. The carrier has no presence in Wales, outside of Cardiff and Swansea, and nothing north of Scotland's Edinburgh and Glasgow. BR Telecom's cables, however, go everywhere the railway goes.

And when it comes to those cables, Borer has no worries about his firm's expertise. About 70% of BR Telecom's lines are digital, and the network includes 1,500 miles of fiber-optic cable. In two years, he expects the entire network to be 100% digital and fiber.

"We've got some very good technical and engineering staff," Borer said. "They provide a service to a very demanding customer, especially in terms of reliability and resilience."

Past experience indicates that a start-up carrier such as BR Telecom can succeed, he added. After all, Mercury managed to become one of the fastest growing companies in Europe with just 5% of the U.K. market. ☐

T-1/E-1 links to support network

continued from page 35

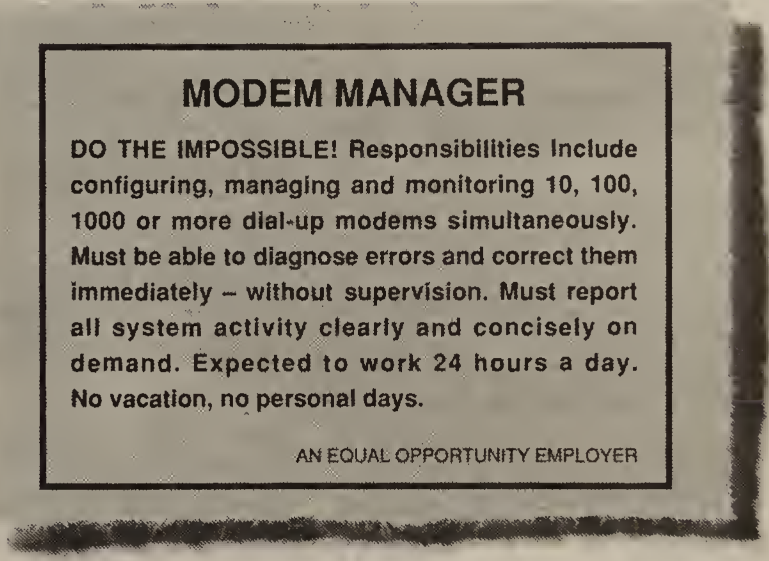
Northern Telecom packet switches to support this network.

SWIFT plans to cut over its Codex fast-packet switching network in July, said John Shearing, director of operations at SWIFT. The fast-packet backbone is designed to handle mounting traffic between the three data centers created by new applications, such as X.400-based interbank file transfers.

The fast-packet switching backbone will lie beneath the existing Northern Telecom transport net, Shearing added.

"If we were not going to use fast-packet switching and used traditional [time-division multiplexing], we would be at about 100% capacity today on the T-1 and E-1 lines," he said. "By the end of the year, we'd be looking at adding a second set of T-1 and E-1 links."

Bill Vines, director of worldwide applications at Codex, said that down the road, SWIFT may expand the fast-packet network to include as many as 10 sites to aggregate traffic and transmission links at some of its bigger regional nodes. An expansion schedule has not been set, he said. ☐



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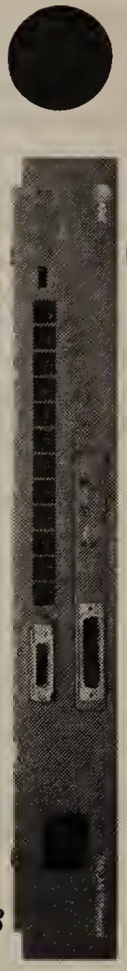

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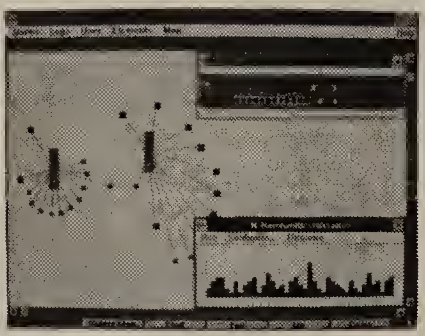

	AT&T	Cabletron Systems	SynOptics™ Communications
Ports Locking	Yes	Yes – MMAC-3 No – MRXI-2	Yes
Intrusion Control	Yes	Yes – MMAC-3 No – MRXI-2	Yes
Eavesdrop Prevention	Yes	No	No
Map Generation	Yes	Yes	Yes
User Movement Alarming	Yes	No	Yes
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First Look

Eicon adds trio of gateways to SNA family

Eicon Technology Corp. has added three new products — the **SNA LAN Gateway** and **SNA PC Gateway for DOS** and **SNA PC Gateway for OS/2** — to its existing IBM Systems Network Architecture family of host connectivity products.

According to Eicon, the SNA LAN Gateway is a multiprotocol software package that runs on a Novell, Inc. NetWare server, giving local-area network clients IBM 3270, 5250 and LU 6.2 communication capabilities for local or remote access to IBM SNA hosts.

The package supports X.25/Qualified Logical Link Control (QLLC) and Synchronous Data Link Control protocols for remote access and IBM's Token-Ring Interface Controller for local connectivity. The other two software packages are for remote stand-alone access from personal computers to SNA hosts.

The SNA PC Gateways for DOS and OS/2 support X.25/QLLC and SDLC links to mainframes. They also support line speeds of up to 384K bit/sec.

Available now, the SNA LAN Gateway costs $795; the SNA PC Gateways cost $195.

Eicon Technology Corp., 2196 32nd Ave., Montreal, Quebec H8T 3H7; (514) 631-2592.

Compulink unveils new imaging software

Compulink Management Center, Inc. has brought out Version 4.3 of **LaserFiche LAN,** its document imaging software for image storage, retrieval and management on Novell, Inc. NetWare local-area networks. The new version includes a word index listing and word search function with optical character recognition (OCR) that can locate OCR errors for correction.

LaserFiche LAN 4.3 is available now for $4,995 for a one- to four-user network version.

Compulink Management Center, Inc., 370 S. Crenshaw Blvd., Suite E106, Torrance, Calif. 90503; (213) 212-5465.

(continued on page 42)

HP SharedX supported systems

Workstation	Operating system	Send	Receive
Series 300/400	HP-UX 7.XX	✓	✓
Series 300/400	HP-UX 8.0	October 1991	✓
Series 700	HP-UX 8.05	October 1991	✓
HP X Stations (X Window terminals)	Not applicable	To be announced	✓
Domain Series	DomainOS 10.3	On special contract basis	✓

Currently, only HP's SharedX software for HP-UX 7.XX environments has the capability to send and receive X Window data.

GRAPHIC BY SUSAN J. CHAMPENEY

SOURCE: HEWLETT-PACKARD CO., CUPERTINO, CALIF.

HP software lets X Window users share screens of data

Enables six users to view and edit concurrently.

By Jim Brown
Senior Editor

PALO ALTO, Calif. — Hewlett-Packard Co. last week announced software that enables users of workstations running the X Window protocol to concurrently view and edit screens of data.

SharedX software makes it possible for engineers to simultaneously view and modify an engineering plan or enables software developers to jointly work on application code.

SharedX lets one user download an X Window screen image to as many as five other users on the same local- or wide-area network.

> SharedX software enables software engineers to jointly work on application code.

▲▲▲

The user sending the screen image can assign editing capabilities to one or more of the receivers. The five users can then establish a teleconference and modify the screen image.

SharedX software, which must run on each workstation that is sending screens, includes an HP-developed extension to the X Window server software. Receivers do not have to run any special code to display screens downloaded from workstations running SharedX.

Existing X Window applications do not require modifications to work with SharedX.

As a beta site for the product, McDonnell Douglas Corp. uses it to enable remote executives and application developers to work with an integrated product design planning application now under development in Columbus, Ohio.

This test enabled the application development team to get feedback about application performance and features from end users, said Mike Fancher, manager of quality, engineering and systems for McDonnell Douglas.

Without SharedX, Fancher said files would have to be downloaded to remote sites or remote users would have to travel to Columbus to work with the new application.

McDonnell Douglas is also examining other uses for SharedX. For example, Fancher said company engineers and subcontractors could interactively view and modify product design plans.

"We have this tool a little in advance of our being able to take advantage of it," Fancher said. "But I know this is going to be useful in more ways than I can imagine."

Currently, SharedX only works with workstations running HP-UX, HP's Unix implementation. The firm will introduce versions of SharedX for other operating systems including the Open Software Foundation's OSF/1. A version for the HP Apollo Division's DomainOS will be developed under special contract.

Available now, SharedX costs $495 for a single-user license. An eight-user license is priced at $3,300; a 24-user license is $9,000; a 48-user license is $15,000; and a 96-user license is $25,000. Documentation and the disk or tape with SharedX code costs an additional $495.

Unisys pack creates mainframe quartet

Gladiator hardware, software lets users net 4 Unisys mainframes as single system with backup.

By Paul Desmond
Senior Editor

BLUE BELL, Pa. — Unisys Corp. recently announced a new package of existing hardware and enhanced software that lets users network as many as four Unisys 2200 Series mainframes, allowing the machines to function as a single host and back one another up.

The Gladiator package consists of Unisys mainframes and other hardware plus at least 40 software packages that come preconfigured to let the Unisys OS1100 operating system support applications running across multiple hosts.

Most of the software is already available except for the OS1100 enhancements that give the multihost operating system support for more general-purpose data bases.

Gladiator is intended to let Unisys users leverage their hardware investments by enabling them to connect as many as 24 processors, housed in four mainframes, to build a redundant Gladiator system.

A system configured with four mainframes offers performance approaching 3,000 transaction/sec and system availability of 99.99%. By contrast, the largest Unisys 2200 Series mainframe supports about 860 transaction/sec.

Gladiator expands on the capability that Unisys shipped in April 1989 with its OS1100 Extended Transaction Capacity (XTC) product. XTC enables users to spread applications over as many as four 1100/90 and 2200 Series mainframes but works only with the data base offered with Unisys' Transaction Interface Package, which is specifically tailored for airlines.

Gladiator works with the three additional and more general-purpose Unisys data bases: the Relational Data Management System 1100 relational data base; the Data Management System 1100 network and hierarchical data base; and the Shared File System 1100 random and index sequential data base.

Unisys' SQL*Star 1100 suite of products can be employed in conjunction with Oracle Corp.'s Oracle SQL*Star to provide access to other data bases that support SQL, such as IBM's DB2.

Likewise, existing Unisys products for IBM and Transmission Control Protocol/Internet

(continued on page 107)

Tangram gives MVS users access to DOS, OS/2 devices

CARY, N.C. — Tangram Systems Corp. said it will release this month a product that lets users with IBM MVS mainframes distribute data and software to and collect information from remote DOS workstations and OS/2 network servers and clients.

AM:PM is a component product of Arbiter, Tangram's 5-year-old mainframe-to-workstation product line that enables users to support various capabilities, including terminal emulation, file transfer and mainframe virtual disks for microcomputer users.

AM:PM can run as a single application in the Arbiter environment under VTAM, or it can be used with other components.

According to the company, the product will enable users to create jobs that list units of work to be executed, typically involving data transfer operations from a host to a pool of microcomputers. The jobs are then scheduled to run at specific times, whether at a single preset date and time or on a periodic basis.

Workstation users have no control over the AM:PM process. DOS-based machines are outfitted with a 10K-byte terminate and stay resident (TSR) program that runs in the background.

At an appointed time, the program notifies the end user with a message selected by the customer that he should exit his application and return the microcomputer to the DOS prompt, according to Karen Mitchell, senior systems developer.

The TSR then loads the main AM:PM application, which takes over the machine and contacts the host. Once the job has been run, the application will termi-

(continued on page 40)

Soft-Switch gives its E-mail users fax, telex capabilities

Two gateways expand reach of electronic mail.

WAYNE, Pa. — Soft-Switch, Inc. recently announced two gateways that integrate facsimile and telex capabilities into its line of electronic mail software.

The company's Enterprise Fax Gateway/VM and Enterprise Telex Gateway/VM provide E-mail users with the ability to send and receive facsimile and telex messages from within their E-mail applications.

"Users can now originate messages in electronic form without worrying whether or not all recipients have E-mail capability," said David Foster, Soft-Switch's vice-president of marketing.

The two new software products will initially run on IBM mainframes supporting the VM operating system Release 4.0 or later, although the vendor plans to support other environments as well. Messages are created and sent using each system's native user interface. A message may be sent to a distribution list made up of E-mail, fax and telex addresses, and delivered in the appropriate form to each recipient.

On the facsimile side, Soft-Switch's Enterprise Fax Gateway/VM supports the transmission of compound documents consisting of text and graphics. Logos, signatures and other scanned images may be combined with text.

The telex gateway provides a central telex facility for transmission and receipt of telex messages. Both products provide the ability to interface to Soft-Switch directory services to route incoming faxes and telexes to E-mail users in an organization.

The facsmile and telex modules also provide tracking and control features.

Foster said the enhancements may be particularly valuable to customers who wish to create E-mail-enabled applications in which message traffic is originated by an application.

A customer service application, for instance, can be tailored to send a product bulletin to customers via fax, telex or E-mail. At the same time, a copy of the materials can be sent via E-mail to a sales representative or other personnel that work with the client.

Micheal Zisman, Soft-Switch's chairman and chief executive officer, said the products are part of a commitment to broaden the role of electronic mail. "E-mail is no longer about the exchange of simple text messages within closed work groups," Zisman said. "It deals with the exchange of multiple object types throughout and across an enterprise."

Users need facsimile technology integrated with E-mail to save on the cost of rekeying data once it arrives in hard-copy form, he added. And telex will be important in developing regions such as Eastern Europe.

The facsimile and telex gateways are now available for VM mainframe environments. Pricing for the Enterprise Fax Gateway/VM begins at $32,000, while the Enterprise Telex Gateway/VM starts at $30,000. Both products are scheduled to ship in the third quarter.

For further information, contact Soft-Switch at 640 Lee Road, Wayne, Pa. 19087, or call (215) 640-9600.

MVS users gain access

continued from page 39

nate and give control of the device back to the user.

If the microcomputer has been turned off, scheduled jobs will be executed when it is next turned on, Mitchell said. Alternatively, users can set expiration intervals, after which jobs will simply be abandoned and the event noted in a log on the mainframe.

If a user inadvertently leaves an application on a machine, the TSR can be configured to wait a predetermined amount of time and then automatically reboot the machine and establish the link to the host.

The process is similar when the target microcomputer is running OS/2, the exception being that the multitasking operating system can support file transfer and other operations in background without hindering the regular operation of the microcomputer.

Links to all workstations are maintained under VTAM, although the physical connections can vary widely. DOS machines, for example, can be tied to a host using anything from a 3270 emulation board to a link through a local-area network gateway or an X.25 connection through a packet-switching interface on a front-end processor.

OS/2 workstations are supported using LU 6.2 over Synchronous Data Link Control, token-ring, X.25 or coaxial cable links.

Both types of workstations are identified by a symbolic node name. This name is set on the workstation when AM:PM is configured and may be the same as the workstation logical unit name under VTAM.

All jobs are scheduled using the node name, meaning that the workstation does not always have to connect using the same VTAM logical unit.

The jobs supported by AM:PM are actually a collection of operations that execute in sequence for a specified workstation node.

Examples of operations include transferring files, executing a command or program on the remote workstation, submitting a batch job to the host, checking on workstation software versions and renaming files as well as rebooting the microcomputer.

File transfer, the main operation supported by AM:PM, can consist of a single file or a group of files folded together and treat-

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ed as a single unit, such as all the files within an application. Automatic checkpoint/restart is provided during the transfers so that if the connection goes down, the workstation will automatically try to reconnect to the host and pick up the session.

Other features provide integration with mainframe security packages, such as IBM's resource access control facility (RACF), as well as file and software version checking. There is also a data compression feature that promotes data integrity, according to Tangram.

> If a user inadvertently leaves an application on a machine, the TSR can be configured to wait a certain amount of time and automatically reboot the machine and establish the link to the host.

▲▲▲

Information to be stored on the MVS host is kept in VSAM data sets, which are designed to store data in the native personal computer format, meaning data does not have to be converted from one format to the other during file transfer.

The product can be administered on the host using the Arbiter System Administrator Facilities, which allows job scheduling to be performed either manually or through batch jobs.

AM:PM, scheduled to be available by the end of the month, will cost existing Arbiter customers $45,000 to $98,000, depending on host configuration. The price of Arbiter and AM:PM for new customers ranges from $82,000 to $190,000. The price includes a mainframe license and can be used by an unlimited number of personal computer users.

Contact Tangram at P.O. Box 5069, 118 Mackenan Drive, Cary, N.C. 27511, or call (919) 481-4444.

Gateway unveils Ethernet LAN monitoring software

IRVINE, Calif. — Gateway Communications, Inc. this week plans to roll out its EtherStat network monitor software for Ethernet local-area networks.

EtherStat can be used to isolate and track a wide variety of network faults, such as servers transmitting bad data packets, net congestion or data framing errors.

EtherStat runs on a personal computer, monitoring and gathering information on as many as 250 devices on an Ethernet. It assimilates data on LAN performance and can double as a LAN analyzer capable of capturing data packets and displaying their contents to determine the source of a network problem.

EtherStat can be configured to capture and display a variety of LAN data types — such as Novell, Inc.'s Internetwork Packet Exchange (IPX), Internet Protocol, Xerox Corp.'s Xerox Network Systems or Gateway's own Interactive Personal Computer protocol — by using any of several filters.

EtherStat continuously captures all or part of actual data traveling across an Ethernet with no packet loss. The software buffers data in 512K-byte chunks, routing it for display to an attached monitor or writing it to disk for future reference.

In addition, EtherStat monitors its own performance and indicates if the host personal computer is not powerful enough to keep up with the capture of data or statistics at high sustained rates. This enables network personnel to recognize when to upgrade the processor on the host computer in order to keep up with network traffic.

EtherStat is equipped with a trigger function, which controls the amount of data captured when a specific event occurs, such as a packet collision, bad packet or full buffer. Data captured by the trigger creates a window of information that preceded and followed the event.

In addition, five audible and visual alarms may be set up in conjunction with the trigger to alert a network manager to the occurrence of different events.

Network personnel can use the network monitor to determine a baseline level of network activity and use that as a threshold to gauge subsequent LAN events.

EtherStat can also be used to monitor node activity and utilization percentages, enabling network administrators to decide whether to change the LAN adapter used at a particular workstation, upgrade to a more powerful machine, or restructure file server access to achieve a desired level of performance.

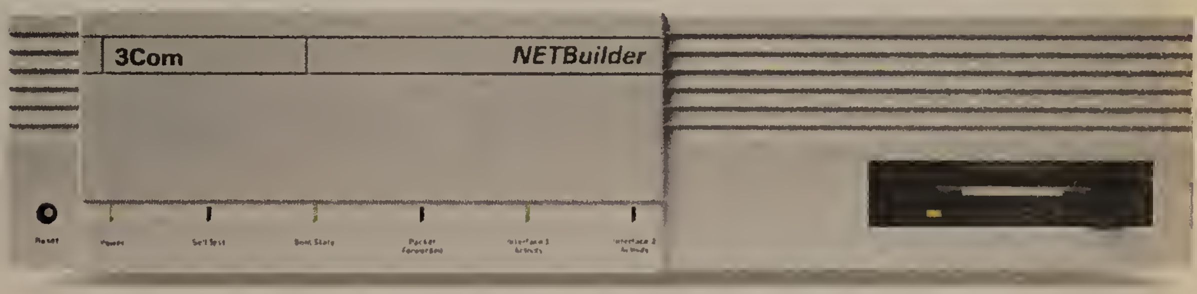
EtherStat operates in three modes: Setup, which controls the programs operation; Capture, which passively monitors net traffic by capturing data as specified by a network administrator; and Display, which presents captured data on an attached monitor.

EtherStat runs on a dedicated IBM Personal Computer AT or compatible with a minimum of 256K bytes of memory and Gateway's G/Ethernet LAN adapter or G/Ethernet AT LAN Adapter.

Available now, EtherStat costs $250.

For further information, contact Gateway at 2941 Alton Ave., Irvine, Calif. 92714, or call (800) 367-6555.

Ch Changes.



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Videoconferencing system gives users access to network data files

DALLAS — VideoTelecom recently took the wraps off a personal computer-based videoconferencing system that enables users to interactively view and revise computer files.

MediaMax is the central component of the company's new Benchmark series of so-called mediaconferencing systems, which establish a videoconference and provide a separate window for presenting data from spreadsheets, design files or other data stored on a disk, or from a server on an attached local-area network.

According to VideoTelecom, MediaMax is better than traditional videoconferencing systems because it enables users to view and modify computer files interactively.

Such a capability will enable users to revise engineering drawings on the fly or sign off contract changes they otherwise could not do with current videoconferencing systems, said Todd Clayton, VideoTelecom's vice-president of marketing.

MediaMax combines a video codec, audio system and image document system into an personal computer based on Industry Standard Architecture. MediaMax can operate on a stand-alone basis in which it can establish a videoconference and import files from a diskette. Or it can be LAN-attached, enabling users to call up files from workstations or servers on the LAN and use them in their presentations.

Data is displayed in a separate window on the videoconferencing monitor. The system's built-in document manager enables users at either end of the conference to take control of the screen and draw on an electronic sketch pad or modify the contents of electronic document files.

MediaMax is based on a passive-bus personal computer design, freeing users to swap out the system's processor board to easily upgrade from an 80386 to 80486 system.

As part of the announcement, VideoTelecom promoted a concept called time conferencing. Using the company's MediaMax devices, users can record a detailed audio/video message including document data and store it on the system's hard drive or a floppy diskette for later viewing or for use by a user at another location.

The Benchmark conferencing systems — which include the MediaMax conferencing platform — come in four configurations ranging in price from $34,950 to $85,000.

VideoTelecom said it has signed agreements with a number of resellers including Ameritech, BellSouth Corp., GTE Telephone Operations and US West, Inc. to market the Benchmark line.

For further information, contact VideoTelecom at 1901 West Braker Lane, Austin, Texas 78758; or call (512) 834-2700. ◼

Bridge 16 Mb Token-Ring Networks with Andrew

New 16 Mb local and remote source routing bridges from Andrew connect token-ring networks across the street or around the world. High performance local bridges provide efficient connections to 4 and 16 Mb backbone and departmental rings. Remote bridges include data compression to increase throughput over WAN links without increasing link speed cost.

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First Looks

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Artisoft adds Windows support to LANtastic operating system

Artisoft, Inc. recently released a new version of its low-cost peer-to-peer local-area network operating system that includes support for Microsoft Corp. Windows-based personal computers. **LANtastic Version 4.0,** which supports from two to 300 users, can now run from within the Windows environment.

The new version lets users unload LANtastic 4.0 from the random-access memory of an individual workstation without rebooting the machine, allowing users to gain RAM when needed.

Scheduled to be available next month, LANtastic Version 4.0 will be priced at $99 per node or $2,499 for an unlimited version that supports as many as 300 users.

Artisoft, Inc., Artisoft Plaza, 575 East River Road, Tucson, Ariz. 85704; (602) 293-6363.

Accunetics introduces multiport repeater for 10BaseT LANs

Accunetics, Inc., last week announced the **NMS-2000** intelligent, multiport repeater for 10BaseT Ethernet local-area networks that includes network management capabilities.

According to the company, the NMS-2000 consists of both hardware and software that help the administrator with physical-layer network management.

The software runs on a nondedicated personal computer or workstation. Its most important function is the automatic creation of a real-time, physical-layer map of the network showing the location of each personal computer, printer and server. It also automatically alerts the administrator when problems arise on the net.

The hardware, acting as a hub for the network, comes in either a 12- or 24-port rack-mountable configuration. The NMS-2000, which will be available late next month, costs $2,100 for the 12-port version and $4,200 for the 24-port version.

Accunetics, Inc., 190 Blydenburgh Road, Islandia, N.Y. 11722; (516) 348-1566. ◼

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OPINIONS

PRIVACY PROTECTION

BY STUART BROTMAN

Let vendors know how you feel about privacy protection

Privacy protection stands out as one area in which telephone companies and private-line carriers can create new competitive advantages by focusing on the real-world concerns of network users.

Virtually every public opinion survey conducted during the past two decades indicates that the American public puts a high social value on the notion of privacy protection — protecting the disclosure of voice or data communications to unauthorized third parties. A recent national opinion survey conducted by the polling firm Louis Harris and Associates, for example, indicates that 79% of the respondents expressed concern about threats to overall personal privacy in the U.S. today, compared with 64% in 1978.

> The American public puts a high social value on the notion of privacy protection.
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Moreover, as technology erodes historical concepts of privacy — making it difficult to evade Big Brother, Big Bank and Big Business — our legal system has adapted accordingly. Increasingly, courts tell us to lower our reasonable expectations of privacy.

In short, the ball has landed in the private sector's court. Network users should thus reassess their privacy needs in order to determine which areas of their companies need security most and who is willing to pay for it. An enterprisewide analysis of privacy concerns will help focus on what particular units need for assuring operating efficiency and employee comfort.

They've got it on their list

Recently, the New York Department of Public Service released a list of privacy principles for telecommunications service providers to consider. Although some might perceive this list as a government warning for network vendors to get their privacy houses in order, it also clearly conveys another message. Put simply, the Public Service Department has articulated what some network vendors have already correctly deduced: Privacy protection is not only a social concern but can also be packaged as a commodity to attract new customers.

"Privacy," the department asserts, "should be recognized explicitly as an issue to be considered in introducing new telecommunications services. Companies should educate their customers as to the implications for privacy of the services they offer. People should be permitted to choose among various degrees of privacy protection with respect to both the outflow of information about themselves and the receipt of incoming intrusion."

Privacy protection seems ready to be plugged into the competitive advantage equation. Companies that design telecommunications services that emphasize privacy protection as an important element, or offer several levels of protection at different prices to network users, are likely to find themselves ahead of the competitive pack.

Network users who are assertive in educating vendors about their privacy needs can be key players in shaping, rather than merely reacting to, marketplace developments.

The ability of telephone companies and private-line providers to achieve a competitive advantage sometimes seems akin to the search for the Holy Grail. The lure of using privacy protection to that end is too great for vendors to ignore.

Brotman is a Boston-based communications lawyer and management consultant.

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EDITORIAL

NW's Critical Issues Survey shows networking's strength

Some economists say the recession may finally be coming to an end. And here's some more good news: There are indications that network departments have been doing relatively well despite the recession.

This evidence comes from *Network World's* latest Critical Issues Survey, which begins on page 1.

Although it shows staff reductions at some firms as a result of layoffs or attrition, these cutbacks were easily offset by new hirings at many companies. The overall result was that employment in networking departments increased over the last 12 months at the 100 companies surveyed.

This is in keeping with the trend in earlier recessions, in which demand for networking staff continued to be strong despite surging unemployment.

More importantly, it puts to rest some of the fears that were circulating in January, when *Network World* ran its 1990 Salary Survey. Approximately 60% of the respondents to that survey said they were worried about the effect of the recession on their departments.

This year's Critical Issues Survey, however, proves that these fears were not realized. Instead of cutting back on staff, 88% of the companies held even or expanded their networking work force.

Because the Critical Issues Survey is conducted with a very small sampling (100 users queried in telephone interviews), it should only be taken as an indicator, not as a scientific poll.

But on the economic question, the survey does highlight a general trend. While companies are cutting staff in many areas as the unemployment figures show, the survey says that many companies have resisted cutting networking staff.

Of the 100 networking executives surveyed, 42 reported an increase in staff over the previous 12 months, 46 were in firms whose staff remained unchanged and only 12 reported a decline.

Most importantly, the hiring of new staff by the 42 firms that increased personnel more than made up for the reductions in the 12 that reported cuts.

Clearly, the recession has affected networking, in some cases making firms put their expansion plans on hold. The survey hints at this: The 46% of firms that neither expanded nor contracted their staff might well have expanded it during better times.

But networking has been weathering the storm well, primarily because it has become vital to corporations. The survey thus validates the strategic importance of networks to corporations.

OPINIONS

GLOBAL ACCOUNT PROGRAMS

BY MARY JOHNSTON-TURNER

Taking the next step in strategic vendor relations

For several years, users have been going it alone in building global private-line networks. They've deliberately avoided becoming too closely tied to one carrier and have generally shunned the notion of tightly coupling their business to any single interexchange or local exchange carrier. But now major users are singing a different tune.

Increasingly, users are talking about strategic partnerships with their international carrier of choice, generally a U.S. long-haul carrier. One primary reason for this trend is the difficulty of dealing with post, telegraph and telephone administrations from a distance.

Until this year, most public network service improvements and support systems were limited to domestic services. International circuits have generally taken months to provision and even longer to troubleshoot.

For the increasing number of users running multinational networks, 1991 may be a banner year as carriers begin to expand global account programs to cover international networking.

Despite a recent spate of implementation delays, AT&T, MCI Communications Corp. and US Sprint Communications Co. are each beefing up their global account programs.

These efforts involve developing common administrative and trouble-tracking systems; improving billing handoffs; and permitting U.S. and PTT personnel to work together to resolve problems and develop software that allows domestic network management systems to use information from PTT signaling networks.

These efforts will eventually result in more streamlined procedures and high-quality end-to-end service.

AT&T is working hard on alliances with British Telecom International, Inc., France Telecom and Kokusai Denshin Denwa Company, Ltd. In addition, MCI's Global Communications Service lists 17 international partners, and US Sprint is closely associated with Cable & Wireless Worldwide Services in many countries around the world.

These carrier partnerships are preprovisioning circuits and equipment, supporting customer equipment collocated in their overseas switching locations, extending domestic virtual network capabilities overseas and providing overseas account support staff to work with end users' key regional offices.

> Despite recent implementation delays, AT&T, MCI and US Sprint are beefing up their global account programs.
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For the largest users, which have run their own international leased-line networks for years, these new global account programs will provide consolidated billing, accelerated circuit provisioning and troubleshooting, and perhaps some volume discounts.

However, it is unclear whether the global account programs will be able to provide a more reliable and more flexible network than users have been able to build using internal staff resources and private multiplexing equipment. The largest users should approach these global account programs carefully.

The partnerships now being forged among international carriers are primarily administrative in nature. Automation of international fault management and problem resolution processes is probably two to three years off.

In the meantime, the largest user companies may find that the quickest way to resolve problems and provision circuits is through domestic resources and contacts.

However, free account support can take a network only so far. Fortunately, users that need dedicated overseas management resources without the expense and hassle of relying on internal staff have recourse to a number of fee-based services and outsourced international network management centers.

Modeled on domestic carrier-provided network management centers, these fee-for-service companies will take on maintenance of customer premises equipment, provisioning and troubleshooting of circuits, carrier coordination, network planning and any other operational tasks for which the user is willing to pay.

Despite the above benefits to the largest users, the big winners are likely to be smaller companies that have not previously required international communications and, therefore, have no internal expertise.

Also likely to make out well are those that cannot cost-justify large internal investments in staff and multiplexing equipment but nevertheless desire better service than they can get via dial-up point-to-point lines and public X.25 networks.

Maximum use of global account services could obviate the need for such users to dedicate an internal staffer to circuit provisioning, billing coordination and troubleshooting.

Carriers are most likely to offer global account support and international net management to their largest users first, but companies of all sizes will eventually benefit from them.

Johnston-Turner is a principal with Northeast Consulting Resources, Inc., a Boston consulting collaborative specializing in management, communications and information strategies.

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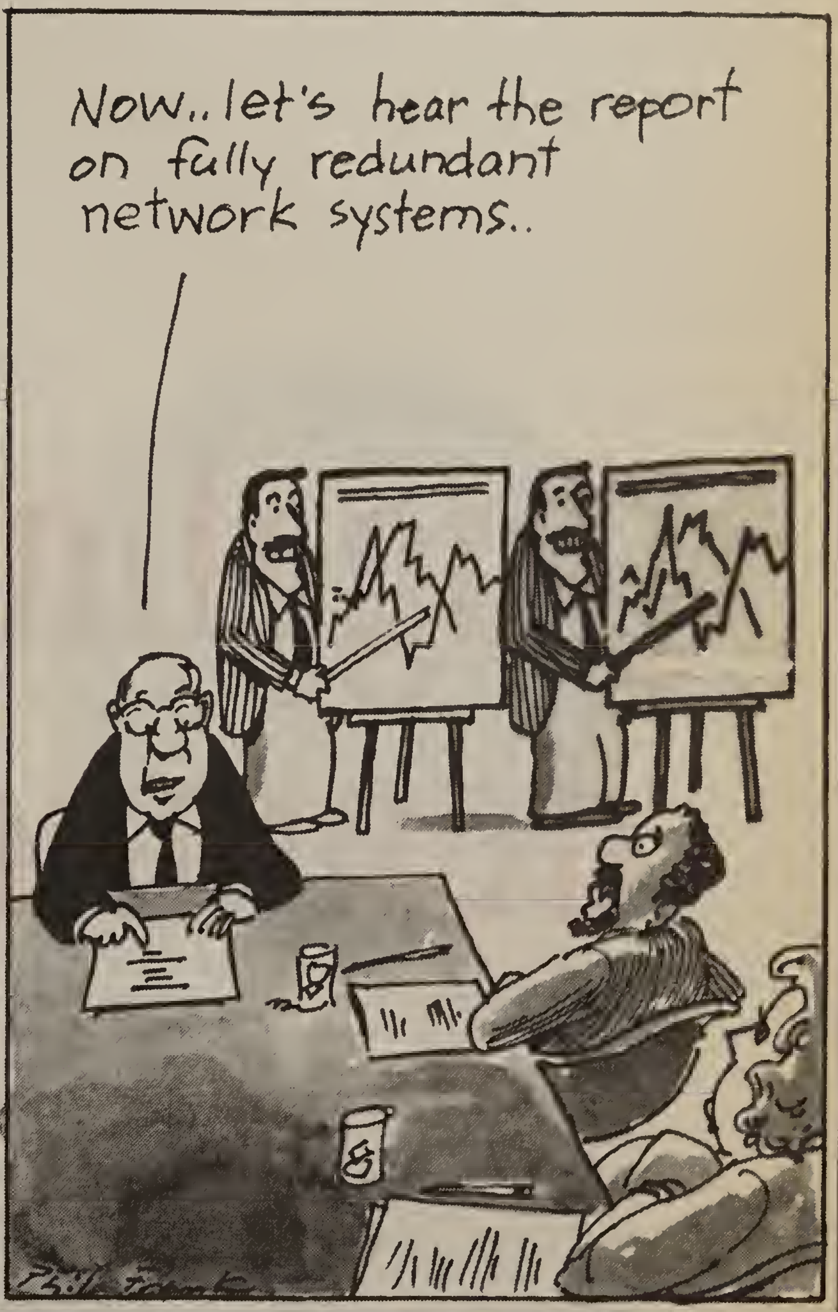
TELETOONS

BY FRANK AND TROISE


Now.. let's hear the report on fully redundant network systems..

LETTERS

The loss of a friend

It came as a shock to most of us in the industry to learn that Elizabeth Jane Williams of Cable & Wireless Communications, Inc. — known as Betsy to almost everybody — passed away suddenly a few weeks ago.

Betsy, a senior manager of private-line services for Cable & Wireless, was a rarity: upbeat, energetic, helpful, knowledgeable in all aspects of her job and easy to work with. To those of us who always seemed to be calling on her in a jam or on a short deadline, Betsy was there to help. She genuinely cared about her job, her company and her coworkers.

We're sorry to lose her knowledge, her energy, her professionalism and her sense of humor.

Betsy is survived by her 12-year-old daughter.

Daniel Briere
Bruce Guptill
Mark Langner
TeleChoice, Inc.
Montclair, N.J.

Consultant licensing

Your article about licensing communications consultants ("Should communications consultants be licensed?" *NW*, April 15) was timely and of critical importance to everyone involved in the communications industry. Many states are attempting to subject consultants to licensing requirements that could spell the end to many careers and practices.

The professional licensing exam does not address telecommunications specifically. The professional engineering licensing requirements in many states allow those with no specific training or expertise to be "telecommunications engineers."

(continued on page 87)

Network World *welcomes letters from its readers.*

Letters should be typed and double-spaced. Mail them to Editor, Network World, *161 Worcester Road, Framingham, Mass. 01701.*

Letters may be edited for space and clarity.

SURVEY:

Critical issues facing users

Juggling network demands

CONTINUED FROM PAGE 1

had attacked their nets over the last year.

Another security problem resulting from open access to networks is "private branch exchange time stealing," which is the placing of unauthorized telephone calls by outsiders who have cracked the PBX access code. Eight percent of survey respondents report they have experienced losses due to PBX time stealing.

Staffing issues

While concerned about increasing security threats, network managers are continuing to cope with their normal tasks, such as dealing with user demand for corporatewide electronic mail and Electronic Data Interchange connectivity. Net managers tackling these requests find they need more staff to handle the growing demands for network services within their companies.

This growth in demand for network services has led to continued growth in networking staff, according to this survey. Forty-two percent of survey respondents say they increased their networking staff last year. Forty-six percent say their staff stayed the same size, while only 12% say their staff decreased.

Among those who report increases, 34% say they added one new position, another 25% say they added two positions, and 15% say they added three positions.

On the average, survey participants added an additional 5½ positions to networking staffs last year. That number is skewed somewhat by one respondent who claims to have added 50 new positions.

Among those respondents who report staff decreases, 36% say they dropped one staffer last year, 9% say they decreased staffing levels by three workers, and another 9% say they reduced their staff by five members. Among the firms reporting staff decreases, the average decrease was 17 staff members. But again, this number is skewed by one large response — one net manager says 97 staffers were let go last year.

Overall, more than three times as many respondents say they increased rather than decreased staff. All together, survey respondents reported a net gain in the number of networking positions — adding 228 networking jobs while decreasing staff by 188 jobs.

Still, the additional staff may not be sufficient to handle the growing demands on networking departments.

Many net managers do not have enough skilled personnel, particularly workers trained in several key networking technologies, to handle these increasing needs (see graphic, page 1). For instance, 53% of survey respondents say they are concerned about shortages of skilled personnel to work on their local-area networks.

Additionally, 46% of the net managers surveyed say they have trouble finding skilled personnel to perform network management duties. And while 40% of survey respondents see a shortage of skilled data communications personnel, only 24% of telecommunications network managers saw a shortage.

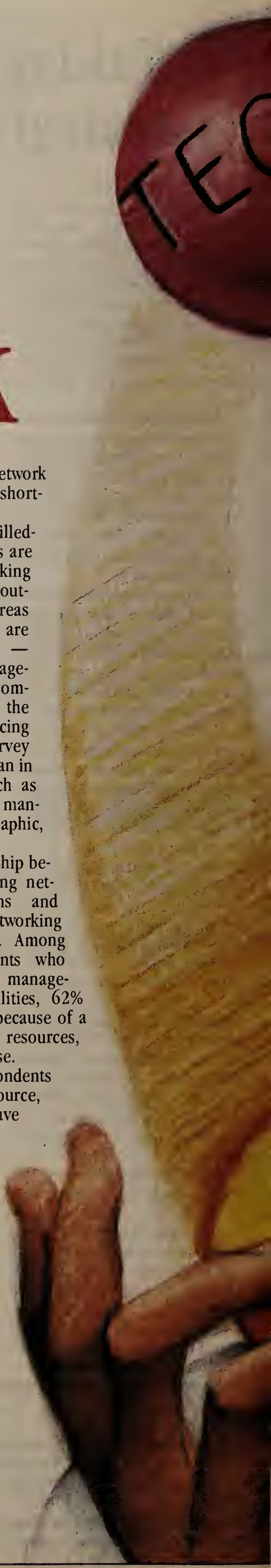
These skilled-worker shortages are driving a networking industry trend: outsourcing. In areas where workers are harder to find — such as net management and data communications — the rate of outsourcing found in this survey is 50% higher than in other areas, such as voice network management (see graphic, page 1).

This relationship between outsourcing network operations and hard-to-find networking skills is strong. Among those respondents who outsource net management responsibilities, 62% say they do so because of a lack of in-house resources, staff and expertise.

Among respondents who do not outsource, 50% say they have sufficient in-house staff,

(to page 103)

Network managers voice their concerns on staffing, service and technological issues.



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BUYER'S GUIDE

BRIDGES, ROUTERS AND BROUTERS

Buying smart

Some advice on how to choose from the more than 140 bridges, routers and brouters currently available.

By EDWIN MIER

The quintessential ingredients in enterprisewide networking are bridges and routers. The good news for users is that the marketplace is teeming with models that can precisely fit every connectivity niche and almost every pocketbook.

The bad news is that choosing from this bountiful supply will force users to sift through mounds of arcane marketing and technical literature in search of just the right device for their particular needs.

Mier is president of Mier Communications, Inc., a Princeton Junction, N.J.-based network consultancy that specializes in customized protocol analysis and planning.

To help in this quest, the salient characteristics of the current offerings from more than 60 vendors have been compiled in the charts that begin on pages 52 and 72.

Building bridges

History continues to play a role in the market for bridges and routers. For example, the majority of available bridges and routers support primarily the first standard local-area network, Ethernet. Though the token ring is now more than five years old, there are far fewer bridges available that support it.

Only a handful of bridges and routers support the diminishing number of proprietary LAN types, such as Apple Computer, Inc.'s LocalTalk and Datapoint Corp.'s Arcnet. Increasingly, however, these specialty bridges and routers serve to connect these orphan LAN communities to standard Ethernet and Transmission Control Protocol/Internet Protocol-based backbone networks.

The number of bridge and router products supporting particular LAN types naturally reflects the installed LAN base, but it also represents vendor and analyst projections of where the LAN marketplace is headed.

CHART • GUIDE

A Buyer's Guide chart comparing bridges begins on page 52; another chart comparing routers and combination bridge/routers starts on page 72.

Key to the bridge and router marketplace is the anticipated emergence and deployment of LANs based on the new 100M bit/sec Fiber Distributed Data Interface specification. As shown in the charts, bridge and router products that enable existing LANs and protocols to tap into FDDI backbones are already offered by more than a dozen vendors.

Of the many models of bridges that are profiled in the charts, nearly 75% are primarily oriented toward Ethernet-to-Ethernet connectivity.

(continued on page 56)

Bridges (continued on page 58)

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/features	Link-level protocols supported	Performance/capacity	Management	Price
Accton Technology Corp. Fremont, Calif. (415) 226-9800	EtherBridge-L	Local; 2 LAN ports	Ethernet: AUI or thin-wire interfaces	NA	Intel Corp. 80186 (16 MHz); desktop, rack-mountable or stand-alone	Transparent bridging; filtering/forwarding based on address, protocol type or user-defined field	None	Filtering: 12K packet/sec per port; forwarding: 10K packet/sec per port (64-byte); address table capacity: 4K per port	LEDs for status and activity	$1,799
Alantec Fremont, Calif. (415) 770-1050	MLS 1033	Local/remote: up to 10 LAN and/or WAN ports	Ethernet: AUI, thin-wire or FOIRL interfaces	RS-232, V.35, RS-449, T-1 (framed, unchannelized or fractional)	Intel 80386 CPU (33 MHz); 5-slot chassis; rack-mountable or desktop	Transparent bridging, logical filtering, network groups, filtering on address or protocol type	LAP-B (between bridges over WAN links); Spanning Tree Protocol	Filtering: 20K packet/sec; system throughput: 40M bit/sec; address table capacity: 8K	Local console terminal; vendor's SmartLan PC-based management system; SNMP	$7,100 (2 LAN interfaces) to $26,300 (fully configured with 10 LAN interfaces)
	MLS 425	Local/remote; up to 4 LAN and/or WAN ports	Ethernet: AUI, thin-wire or FOIRL interfaces	RS-232, V.35, RS-449, T-1 (framed, unchannelized or fractional)	Intel 80386 CPU (33 MHz); 5-slot chassis; rack-mountable or desktop	Transparent bridging, logical filtering, network groups, filtering on address or protocol type	LAP-B (between bridges over WAN links); Spanning Tree Protocol	Filtering: 20K packet/sec; system throughput: 40M bit/sec; address table capacity: 8K	Local console terminal; vendor's SmartLan PC-based management system; SNMP	$7,100 (2 LAN interfaces) to $10,400 (4 LAN interfaces)
Andrew Corp. Torrance, Calif. (600) 733-0331	Bridgeport 7412 Remote Token Ring Bridge	Remote; 1 token ring LAN port and 1 WAN port	Token ring: 4M/16M bit/sec via DB9 connector	RS-232, V.35, RS-449, X.21, T-1/E-1 (requires external DSU/CSU)	Intel 80186 CPU; rack-mountable	IBM source routing-compatible bridge; links 2 token rings via a single point-to-point WAN link	Source routing; proprietary HDLC with error correction used over WAN link	Filtering: up to 80K frame/sec (maximum for a 16M bit/sec token ring); system throughput: 800 frame/sec (64-byte)	Vendor's Bridge Management Program (runs on PC), fully compatible with IBM NetView and LAN Manager	$4,995 (4M bit/sec token ring); $5,595 (16M bit/sec token ring); $495 for bridge management program
	Bridgeport 7606 Local Token Ring Bridge	Local; 2 LAN ports	Token ring: 4M or 4M/16M bit/sec via DB9 connectors	NA	Intel 80186 CPU; rack-mountable	Source routing bridge; links 2 token rings (4M or 16M bit/sec in any mix)	Source routing; upgradeable to support SRT standard	Filtering: up to 160K frames/sec (maximum for 2 16M token rings); system throughput: 1,800 frames/sec (64-byte) or 14M bit/sec	Vendor's Bridge Management Program (runs on PC), compatible with IBM NetView and LAN Manager	$4,995 (2 4M/16M bit/sec ports); $495 for bridge management program
Applitek Corp. A LANcity Co. Andover, Mass. (800) 526-2489	LANcity Bridge	Local/metropolitan area; 1 LAN port and 1 LAN/MAN port (up to 35 miles via standard CATV)	Ethernet: AUI; MAN port supports baseband, fiber or CATV connection; CATV supports up to 56 concurrent Ethernet channels	MAN port supports baseband, fiber or CATV connection; CATV supports up to 56 concurrent Ethernet channels	Motorola, Inc. 68000 CPUs (10 MHz); rack-mountable or stand-alone	Transparent learning bridge; designed for metropolitan-area LAN interconnection; filters on address and protocol type	None specified; frequency-agile CATV modems switch between Ethernet channels	Filtering: 1,200 packet/sec per port; system throughput: 1,200 packet/sec (64-byte) or 4.5M bit/sec; address table capacity: 4K	Vendor's Network Management System accesses agent (non-SNMP) within each bridge	$32,000 for starter system (2 bridges and CATV headend); $13,750 per additional bridge
AT&T Computer Systems Morristown, N.J. (800) 247-1212	StarWAN 10:1 Bridge	Local; 2 LAN ports (1 Ethernet and 1 StarLan, 1M bit/sec)	Ethernet: AUI; StarLan: RJ-45 jack	NA	Motorola 68010 CPU; desktop or rack-mountable	Transparent bridge; designed for linking a 1M bit/sec StarLan and 10M bit/sec Ethernet	Designed for bridging OSI and IP protocol types	Filtering: 15K packet/sec (Ethernet), 1,500 packet/sec (StarLan); forwarding: 1,477 packet/sec; address table capacity: 512	None specified	$4,500
	StarWAN 10:4 Bridge	Local; 2 LAN ports (1 Ethernet and 1 4M bit/sec token ring)	Ethernet: AUI; token ring: DB9 connector	NA	Motorola 68010 CPU; desktop or rack-mountable	Designed for bridging OSI protocols between an Ethernet and token ring	Performs OSI protocol group-address translation	Filtering: 15K packet/sec; forwarding: 1,000 packet/sec; address table capacity: 512	None specified	$8,750
	StarWAN 10:10 Bridge	Local; 2 Ethernet LAN ports	Ethernet: AUI	NA	Motorola 68010 CPU; desktop or rack-mountable	Transparent bridge; address-based filtering/forwarding	None specified	Filtering: 15K packet/sec; forwarding: 6K packet/sec; address table capacity: 512	None specified	$5,950
	StarWAN MultiBridge	Local; 2 to 4 Ethernet ports, 1 or 2 FDDI ports	Ethernet: AUI; FDDI: DAS MICs	NA	Motorola 680X0 CPUs; VMEbus architecture; desktop or rack-mountable	Transparent bridge; address-based filtering/forwarding	Address translation, IP frame fragmentation for FDDI-Ethernet bridging; Spanning Tree Protocol planned	Filtering: 500K packet/sec (FDDI), 15,000 packet/sec (Ethernet); forwarding: 40K packet/sec (FDDI), 15K packet/sec (Ethernet); address table capacity: 4,096	Includes RS-232 console for out-of-band administration; SNMP planned	$15,500 to $27,000, depending on configuration
BICC Data Networks, Ltd. Herts, U.K. (0442) 231000	1410 Managed 802.3 Local Bridge	Local; 2 Ethernet LAN ports	Ethernet: AUI	NA	Motorola 68000 series CPUs; configuration unspecified	Transparent bridge; filters on address and protocol type	Spanning Tree Protocol	Filtering: 22K packet/sec; forwarding: 13.8K packet/sec (64-byte); address table capacity: 8,000+	Vendor's ISOVIEW network management system	Not available
	1400 Primary Bridge	Local; 2 Ethernet LAN ports	Ethernet: AUI	NA	Motorola 68000 series CPUs; configuration unspecified	Transparent bridge; filters on address and protocol type	Spanning Tree Protocol	Filtering: 17.1Kpacket/sec; forwarding: 13K packet/sec (64-byte); address table capacity: 1,000+	Vendor's ISOVIEW network management system	Not available
	1420 FDDI/ 802.3 Bridge	Local; 2 ports (1 Ethernet and 1 FDDI)	Ethernet: AUI; FDDI: SAS or DAS MICs	NA	Motorola 68000 series CPUs; configuration unspecified	Transparent bridge; links Ethernet and FDDI LANs; filters on address and protocol type	Spanning Tree Protocol	Filtering: 460K packet/sec (FDDI), 14.8K packet/sec (Ethernet); forwarding: 14K packet/sec (64-byte); address table capacity: 8,000+	Vendor's ISOVIEW network management system	Not available
	1435 802.3 Remote Bridge	Remote; 1 Ethernet LAN port, 2 WAN ports	Ethernet: AUI or thin-wire interface	RS-232, X.21, V.35, V.36, G.703, T-1 (and fractional T-1)	Motorola 68000 series CPUs; configuration unspecified	Bridges Ethernets over 2 WAN links, supports alternate routing, load sharing	LAP-B over WAN links; Spanning Tree Protocol	Filtering: 12K packet/sec; forwarding: 1,230 packet/sec (64-byte); address table capacity: 8,000+	Vendor's ISOVIEW network management system; SNMP	Not available

AMD = Advanced Micro Devices, Inc.
AUI = Attachment unit interface
CSU = Channel service unit
DAS = Dual-attached station
DDN = Defense Data Network
DECmcc = DEC Management Control Center
DSU = Data service unit
EISA = Extended Industry Standard Architecture
ELM = DEC Extended LAN Manager
EMS = Element Management System
ESF = Extended superframe format
FOIRL = Fiber-optic interrepeater link

MAC = Media access control
MAU = Media access unit
MIC = Media interface connector
MMAC = Multi Media Access Center
NA = Not applicable
PPP = Point-to-Point Protocol
RARP = Reverse Address Resolution Protocol
RF = Radio frequency
SAS = Single-attached station
SMT = FDDI Station Management
SRT = Source Routing Transparent
UDP = User Datagram Protocol

This chart includes a representative selection of bridges. These vendors may offer other bridges, and other vendors not included may offer a full range of products.

SOURCE: MIER COMMUNICATIONS, INC. PRINCETON JUNCTION, N.J.

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- ☐ Request for proposal
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2. Purchase timeframe
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- ☐ Within six months
- ☐ Within one year

3. Scope of purchase responsibility
- ☐ Enterprise wide
- ☐ Departmental

4. Purchase influence/number of sites
- ☐ One site
- ☐ 2-9 sites
- ☐ 10-20 sites
- ☐ 21+ sites

101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150

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2.

(continued from page 51)

Most currently available bridges link two or more LANs directly rather than remotely via wide-area network links. Of these local bridges, 60% bridge only Ethernet LANs. While most support just two Ethernet LAN ports, a few support as many as 80.

By comparison, only about 12% of the bridge models in the table are oriented toward linking token rings. These include three remote token-ring bridges, six local token-ring bridges and one model, IBM's Token Ring Network Bridge Program Version 2.2, that supports either local or remote token-ring bridging.

Only a handful of vendors, including CrossComm Corp., Microcom, Inc. and Timeplex, Inc., offer bridges that can be configured to support either token ring or Ethernet.

A relatively new approach, embodied in FiberCom, Inc.'s RingMaster 7200 Bridge, is to bridge these diverse LAN types via an FDDI backbone LAN.

Ethernet to token ring

There continues to be a dearth of direct Ethernet-to-token ring bridge products. Of the bridges listed in the table, only AT&T's StarWAN 10:4 Bridge and IBM's 8209 LAN Bridge address this specific connectivity environment.

Due to the added processing required to accommodate both Ethernet and token-ring link-layer formats — requiring concurrent support of both transparent bridging and either Source Routing or Source Routing Transparent bridging — data throughput over bridged Ethernet-to-token ring links is usually quite low.

For example, the IBM 8209 filters only 10,000 packet/sec for Ethernet and forwards only 3,000 packet/sec. The system throughput ranges from 3.8M to 10.3M bit/sec, depending on configuration and token-ring speed.

In cases where both the Ethernet and token-ring segments use the same protocol, a bridge offers an economical way to connect the two types of LANs ("Getting from Ethernet to token ring by bridge," *NW*, Dec. 31, 1990/Jan. 7, 1991). However, using bridges to connect Ethernet to token ring is not always the best technique.

Routers, which operate at the network layer, are often a better solution. Operating at the network layer is a significant step up as it not only allows routers to assume legitimate identities as both Ethernet and token-ring nodes, but it also serves to distance them from the hectic, confusing pace of direct link-layer translation between Ethernets and token rings.

Bridges and routers handle link-layer protocol translation in different ways. A bridge needs to translate between protocols in both directions on the fly, providing real-time forwarding and format conversion while appearing to both sides as if it isn't even there. A router, on the other hand, assumes a role as an intermediary, conversing first with one side and then with the other, in a language that both understand.

More than a dozen different router and brouter models support a mix of Ethernet and token-ring LANs.

Media support

As long as a user is running Ethernet at the standard 10M bit/sec data rate, the actual physical LAN interface of the bridge or router doesn't really matter. The default interface for Ethernet-supporting units is the attachment unit interface (AUI) in the IEEE 802.3 specification. Several vendors offer relatively inexpensive transceiver modules (priced in the $200 to $250 range) that can adapt the AUI to support 10Base2 thin-wire or 10BaseT twisted-pair Ethernets.

> Only a handful of vendors offer bridges that can be configured to support either token ring or Ethernet.
>
> ▲▲▲

While most of the Ethernet-supporting products in the tables provide AUIs and support standard 10M bit/sec operation, there are a few notable exceptions. Among them is 3Com Corp., which offers two bridge and router models that support Ethernet-like carrier-sense multiple access with collision detection transmission but at only 5M bit/sec over broadband/community antenna television cabling. This means an external radio frequency modem is required. Another is AT&T, which offers StarWAN 10:1, a specialty bridge for linking 1M bit/sec Ethernet-type Starlan LAN segments to a conventional 10M bit/sec Ethernet.

Notably, several Ethernet-oriented vendors offer an interface option for support of the fiber-optic interrepeater link, also in the IEEE 802.3 specifications. And at least one, CrossComm, claims to offer an Ethernet fiber interface based on the 10BaseF specification, still in the draft stage.

The nearly universal physical interface supported for token-ring LAN attachment is the DB connector, which can support

(continued on page 70)

Performance is the Difference.

FDDI Technology Comparison	Multi-Protocol FDDI Routers	RingMaster FDDI Intelligent Bridge
Network Access Control	Yes	Yes
Broadcast Storm "Firewalls"	Yes	Yes
Multi-Protocol Throughput		
Packet Fragmentation	Yes	Yes
Multi-Port Connectivity	Yes	Yes
Alternate Paths	Yes	Yes

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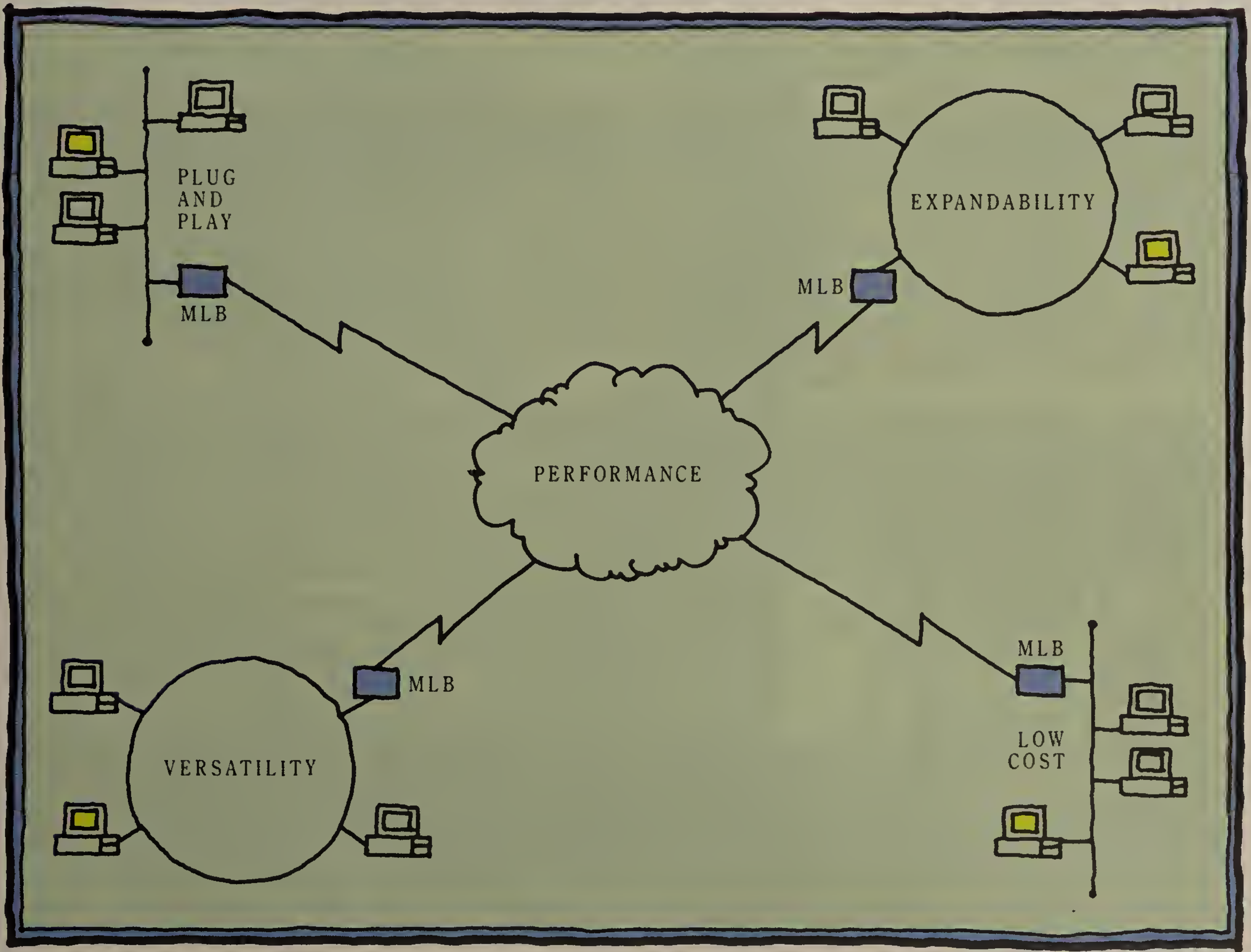

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Bridges (continued on page 62)

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/features	Link-level protocols supported	Performance/capacity	Management	Price
Cabletron Systems, Inc. Rochester, N.H. (603) 332-9400	NB20E Local Ethernet Bridge	Local; 2 Ethernet LAN ports	Ethernet: AUI	NA	Intel 80186 CPU (16 MHz); rack-mountable or desktop	Transparent, self-learning local bridge; filters on address, protocol or 8-byte data field	Spanning Tree Protocol	Filtering: 15K packet/sec; forwarding: 8K packet/sec (64-byte); address table capacity: 2,047	Vendor's SNMP-based Spectrum network management system; SNMP	$2,995; management software packages from $4,995 (for Windows) to $3,995 (SunNet Manager)
	NB25E Local Ethernet Bridge	Local; 2 Ethernet LAN ports	Ethernet: AUI	NA	Intel 80186 CPU (16 MHz); rack-mountable or desktop	Transparent, self-learning local bridge; filters on address, protocol or 8-byte data field	Spanning Tree Protocol	Filtering: 28K packet/sec; forwarding: 11.6 packet/sec (64-byte); address table capacity: 8,191	Vendor's SNMP-based Spectrum network management system; SNMP	$5,495, includes local management and SNMP; $3,995 to $4,995 for separate management software packages
	NB30E Remote Ethernet Bridge	Remote; 2 LAN ports (one is redundant/ back-up) and 1 WAN port	Ethernet: AUI, thin-wire, fiber (ST or SMA connector), and 10BaseT interfaces	V.35, RS-449 (up to 2.048M bit/sec, channelized by external mux); fractional T-1, T-1 (channelized)	Motorola 68000 CPU (16 MHz); rack-mountable or desktop	Transparent, self-learning local bridge; filters on address, protocol or 8-byte data field	HDLC (over WAN links between bridges); Spanning Tree Protocol	Filtering: 10K packet/sec; forwarding: 2.9K packet/sec or 3.8K packet/sec full-duplex (64-byte); address table capacity: 8,191	Vendor's SNMP-based Spectrum network management system; SNMP	$9,645 (V.35 or RS-449 WAN port); $10,145 (T-1 port), includes local management, SNMP
	EFDMIM Ethernet to FDDI Bridge module	Local; FDDI port; bridges to Ethernets via vendor's MMAC concentrator	Ethernet: via backplane to various MMAC media modules; FDDI: DAS MICs	NA	AMD 29000 CPU; module that plugs into vendor's MMAC	Bridges multiple Ethernet subnet-works (up to 168) via a 100M bit/sec FDDI backbone	Upgrading from encapsulation to translation bridging; Spanning Tree Protocol planned	Filtering: 460K packet/sec (FDDI), 14.88K packet/sec (Ethernet); forwarding 10K packet/sec (Ethernet); address table capacity: 8,191	Locally via RS-232 port; vendor's LANVIEW/-Windows software (runs on PC); SNMP (7/91)	$19,995 (firmware upgrade to translation bridging free); $4,995 management software package
	IRBM Intelligent Repeater Bridge Module	Local; 2 Ethernet LAN ports	Ethernet: 1 AUI and 1 fiber interface (ST connectors)	NA	Intel 80186 CPU (16 MHz); module that plugs into vendor's MMAC concentrator	Self-learning local bridge; switchable bridging and repeating between the 2 ports	Spanning Tree Protocol; also supports IP address/Ethernet address binding (via RARP protocol)	Filtering: 28K packet/sec; forwarding 11.6K packet/sec (64-byte); address table capacity: 8,191	Locally via RS-232 port; full remote management via SNMP	$6,500, includes local management and SNMP; $4,995 management software package
Chipcom Corp. Southborough, Mass. (508) 460-8900	ONline Ethernet Bridge Module	Local; 1 Ethernet port; bridges to other Ethernet via backplane of vendor's ONline concentrator	Ethernet: 1 AUI (other Ethernet can be any media module via backplane of concentrator)	NA	Motorola 68000 CPU; module that plugs into vendor's ONline concentrator	Self-learning transparent local bridge	Spanning Tree Protocol	Filtering: 20Kpacket/sec; system throughput: 9.7M bit/sec (based on 1,500-byte packets); address table capacity; 8,000	Locally via RS-232 port; via vendor's Ethernet Management Module; SNMP planned	$4,250
Clearpoint Research Corp. Hopkinton, Mass. (508) 435-2000	Little Dipper	Local/remote; up to 8 Ethernet ports and up to 2 WAN ports (maximum 10 active ports per system)	Ethernet: AUI, thin-wire, 10BaseT interfaces	RS-232, RS-422/449; WAN ports to 256K bit/sec	AMD 29000 RISC CPU (20 MHz); desktop or rack-mountable	Multiport bridge can serve as an Ethernet switch, forwarding from 4 LAN ports to 4 other ports simultaneously	HDLC encapsulation (over WAN links between bridges); Spanning Tree Protocol	Filtering: 90K packet/sec; forwarding: 56K packet/sec (system aggregates, based on 64-byte packets); address table capacity: 4,000	Vendor's StarWatch Network Control; Telnet control port access; SNMP planned	$7,500 (1 LAN, 2 WAN ports) to $18,000 (8 LAN, 2 WAN ports)
	Auriga	Local/remote; up to 4 Ethernet ports and 1 WAN port	Ethernet: thin-wire interface	RS-422/449; port speed to 364K bit/sec	AMD 29005 RISC CPU (15 MHz); multicard set that plugs into AT- or EISA-bus PC	PC plug-in board set and software supports bridging of as many as 4 Ethernet LANs to each other and to WAN link	HDLC encapsulation (over WAN links between bridges); Spanning Tree Protocol	Filtering: 59.08K packet/sec; forwarding: 29.54K packet/sec (system aggregates, based on 64-byte packets); address table capacity: 1,000	Vendor's StarWatch Network Control; Telnet control port access; SNMP planned	$4,500 (4 LAN ports) to $6,000 (4 LAN and 1 WAN port)
Codex Corp. Mansfield, Mass. (508) 261-4000	EtherSpan Bridge	Remote; 1 Ethernet LAN port and 1 WAN port (can be demulti-plexed to 25 remote locations)	Ethernet: AUI, thin-wire or 10BaseT interface	RS-232, V.35, fractional T-1, T-1 (channelized into 24 DS0s; D4/ESF; channels can vary in number and bandwidth)	Motorola 68020 CPU (16 MHz); stand-alone or rack-mountable	Transparent, self-learning bridge designed to forward Ethernet traffic over as many as 25 remote WAN links	HDLC (over WAN links between bridges); Spanning Tree Protocol	Filtering: 14.8K packet/sec; forwarding: 3K packet/sec (system throughput based on 64-byte packets); address table capacity: 8,000	Integral system-wide configuration, monitoring, testing; local terminal port	$6,300 (1 LAN, 1 WAN port); $12,600 (fully configured for 25 remote sites)
CrossComm Corp. Marlboro, Mass. (508) 481-4060	HSB-RR	Local; 2 token ring ports (4M or 16M bit/sec; bridges same or different data rates)	Token ring: interface unspecified	NA	Motorola 68000 CPU (16 MHz); desktop, wall- or rack-mountable	Source Routing and Source Routing Transparent bridge; designed for mixed IBM/non-IBM (Novell, Inc.) environments	IBM Source Routing, IEEE SRT	Filtering: 10K packet/sec per port; forwarding: 7K packet/sec (based on 64-byte token-ring frames); address table capacity: 8,000	Download support; integral diagnostics, performance, alarm monitoring; optional interfaces to IBM NetView, LAN Network Manager	$6,950
	HSB-EE	Local; 2 Ethernet LAN ports	Ethernet: AUI or 10BaseT interfaces	NA	Intel 80376 CPU (16 MHz); desktop, wall- or rack-mountable	Transparent bridging based on address or protocol type	None	Filtering: 15K packet/sec per port; forwarding: 14K packet/sec (64-byte); address table capacity: 40,000	Download support; integral diagnostics, performance, alarm monitoring; SNMP	$4,395
	HSB-ELL	Remote; 1 Ethernet LAN port, 2 WAN ports	Ethernet: AUI or 10BaseT interfaces	RS-232 (V.24), RS-422, X.21, V.35; to 128K bit/sec per WAN link	Intel 80376 CPU (16 MHz); desktop, wall- or rack-mountable	Transparent bridging based on address or protocol type	Spanning Tree Protocol	Filtering: 15K packet/sec per port; forwarding: 1,000 packet/sec (64-byte); address table capacity: 40,000	Download support; integral diagnostics, performance, alarm monitoring; SNMP	$5,995
	HSB-ETT	Remote; 1 Ethernet LAN port, 2 WAN ports	Ethernet: AUI or 10BaseT interfaces	RS-232 (V.24), RS-422, X.21, V.35; to 2.048M bit/sec per WAN link	Intel 80376 CPU (16 MHz); desktop, wall- or rack-mountable	Transparent bridging based on address or protocol type	Spanning Tree Protocol	Filtering: 15K packet/sec per port; forwarding: 10Kpacket/sec (64-byte); address table capacity: 40,000	Download support; integral diagnostics, performance, alarm monitoring; SNMP (optional)	$7,995

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DAS = Dual-attached station
DDN = Defense Data Network
DECmcc = DEC Management Control Center
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MAC = Media access control
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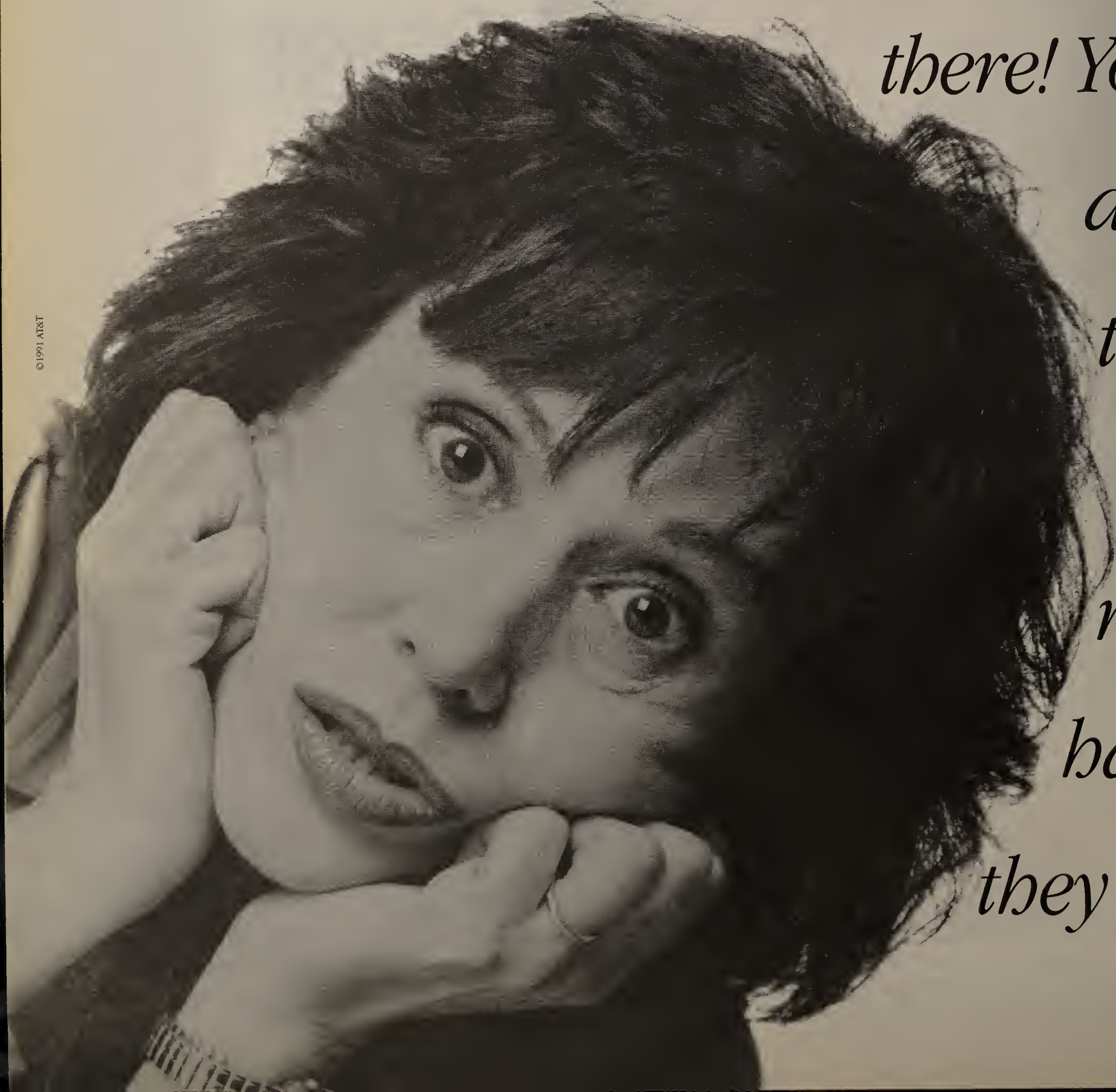

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Bridges (continued on page 64)

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/features	Link-level protocols supported	Performance/capacity	Management	Price
CrossComm Corp. (continued)	ILAN	Local/remote; as many as 4 ports, LAN and WAN, in any combination	Ethernet: AUI, thin-wire, 10BaseT, 10BaseF; token ring: 4M/16M bit/sec	RS-232 (V.24), RS-422, X.21, V.35, fractional T-1, T-1/E-1 (channelized for clear-channel T-1)	Intel 80286 CPU (16 MHz) and proprietary coprocessor; 4-slot chassis; desktop or rack-mountable	SRT bridge, designed to connect Ethernets and/or token rings transparently via WAN link(s)	X.25, HDLC, SDLC (over WAN links); SRT, Spanning Tree Protocol	System forwarding throughput: 4,000 packet/sec (based on 64-byte Ethernet packets/token ring frames); address table capacity: 40,000	Download support; integral diagnostics, performance, alarm monitoring; optional interfaces to IBM NetView, LAN Network Manager; SNMP (optional)	$6,000 (LAN-to-LAN) to $17,000 (fully configured)
DAVID Systems, Inc. Sunnyvale, Calif. (408) 720-8000	ExpressWay Local Bridge, Model 6215	Local; 2 Ethernet LAN ports	Ethernet; AUI or thin-wire interfaces	NA	Motorola 68000 CPU (12 MHz); desktop	Transparent, self-configuring, local MAC-layer bridging; address-based filtering	None specified	Filtering: 12K packet/sec; forwarding: 8.4K packet/sec; address table capacity: 4,096	LEDs (4 per port) for activity, collisions	$2,775; $3,645 for international version
	ExpressNet Supervisor with Bridge, Model 6205	Local; 1 Ethernet LAN port; bridged connection via backplane of vendor's ExpressNet concentrator	Ethernet; AUI or 10BaseT interface	NA	Motorola 68020 CPU (25 MHz); integrated with Management Module, plugs into single slot of vendor's concentrator	Learning or static (user-defined) transparent bridging based on address or protocol type	Spanning Tree Protocol	Filtering: 14.8K packet/sec; forwarding 14,800 packet/sec (64-byte); address table capacity: 8,192	Local RS-232 port for out-of-band management; remote configuration via Telnet; SNMP	$3,500, with ExpressNet Supervisor module (available third-quarter 1991)
Digital Equipment Corp. Maynard, Mass. (508) 493-5111	DECbridge 90	Local; 2 Ethernet LAN ports	Ethernet: AUI and thin-wire interfaces	NA	Proprietary 8590 CPU; desktop, wall- or rack-mountable	Transparent, learning, self-configuring bridging; filters based on destination address	Spanning Tree Protocol	Filtering: 29.69K packet/sec; forwarding: 14.85K packet/sec; address table capacity: 200	DEC's management protocols; SNMP (via a proxy agent)	$3,322
	LAN Bridge 150 and 200	Local; 2 Ethernet LAN ports	Ethernet: AUI, thin-wire and fiber interfaces (fiber link up to 10 km)	NA	Motorola 68000 series and custom CPUs; wall- or rack-mountable	Transparent bridging based on address and/or protocol type	Spanning Tree Protocol	Filtering: 24.27K or 29.76K packet/sec (for LAN Bridge 150 or 200); forwarding: 13.40K or 14.88K packet/sec; address table capacity: 8,000 or 16,000 (LAN Bridge 150 or 200)	Vendor's DECmcc VAX/VMS-based network management system; optional ELM software	LAN Bridge 150: $6,500 ($7,500 for remote-link model); LAN Bridge 200: $8,500 ($9,500 to $14,000 for remote-link configuration)
	DECbridge 500 Series	Local; 2 LAN ports (1 Ethernet,1 FDDI)	Ethernet: AUI and thin-wire interfaces; FDDI: DAS or SAS (single- or multimode)	NA	Motorola 68020 and custom bit-slice CPUs; desktop or rack-mountable	Transparent bridging between Ethernet and FDDI LANs; filtering based on address and/or protocol	IP packet fragmentation (per RFC 791); translation of Ethernet/FDDI data formats; Spanning Tree Protocol	Filtering: 461.3K packet/sec (1 FDDI and 1 Ethernet); forwarding: 14.88K packet/sec (any packet size); address-table capacity: 14,000	FDDI station management (SMT version 6.2); vendor's DECmcc VAX-based management system; SNMP	$25,000 (FDDI-SAS and multimode fiber) to $41,000 (FDDI-DAS and single-mode fiber)
	DECbridge 600 Series	Local; 3 Ethernet ports and 1 FDDI port	Ethernet: AUI; FDDI: DAS or SAS (single- or multimode)	NA	Motorola 68020 and custom bit-slice CPUs; 4-slot chassis; desktop or rack-mountable	Transparent bridging between Ethernet LANs and FDDI; filtering based on address and/or protocol	IP packet fragmentation (per RFC 791); translation of Ethernet/FDDI data formats; Spanning Tree Protocol	Filtering: 488K packet/sec (1 FDDI and 3 Ethernets); forwarding: 22K packet/sec (between all LANs, any packet size); address table capacity: 14,000	FDDI station management (SMT Version 6.2); vendor's DECmcc VAX-based management system; SNMP	$21,000 (3-port Ethernet bridge; no FDDI) to $45,000 (with FDDI-DAS and single-mode fiber interface)
Du Pont Electronics Research Triangle Park, N.C. (919) 481-5100	Ethernet Local Bridge Module	Local; 1 Ethernet LAN port; bridged connection via backplane of vendor's LAN ONE concentrator	Ethernet; AUI, thin-wire, 10BaseT or FOIRL interface	NA	Processor unspecified; module that plugs into vendor's LAN ONE concentrator	Transparent bridging, filtering based on address or protocol type	Spanning Tree Protocol	Filtering: 19K packet/sec; forwarding: 7K packet/sec (64-byte), address-table capacity: 128,000	Vendor's Enhanced Management Software (runs on 386/PC); monitoring, diagnostics via concentrator; SNMP	$2,995; $1,995 for management software package
FiberCom, Inc. Roanoke, Va. (703) 342-6700	RingMaster 7200 FDDI Bridge	Local; 1 FDDI (DAS) and up to 4 Ethernet and/or token-ring LAN ports	Ethernet: AUI; token ring: DB9 con-nector; FDDI: DAS (2 MICs)	NA	Motorola 68020 CPU (20 MHz); VMEbus architecture; desktop or rack-mountable	Transparent bridging between Ethernet and/or token ring LANs and an FDDI (Source Routing supported on token ring interfaces cards)	IP-packet fragmentation; Source Routing (on token ring cards); Spanning Tree Protocol (on Ethernet cards)	Filtering: 500K packet/sec (FDDI), 14.88K packet/sec (Ethernet); forwarding: up to 20,000 packet/sec (64-byte); address-table capacity: not specified	Vendor's View-Master+ network management (client software runs on each bridge); SNMP	Approximately $10,000 per subnet LAN attachment in typical configuration; $1,000 software license; $15,000 for client management software
Fibermux Corp. Chatsworth, Calif. (818) 709-6000	FX5510T	Local; 1 token-ring port (4 or 16M bit/sec) and 1 FDDI LAN port	Token ring: DB9 connector; FDDI: DAS (2 MICs)	NA	Motorola 68000 series CPU; VMEbus architecture; 5-slot chassis; rack-mountable	Source Routing bridge for IBM-compatible MAC-layer routing between token ring and FDDI LANs	Source Routing	Filtering: 13K packet/sec on FDDI side; filtering on token-ring side is at LAN speed (4M or 16M bit/sec); system throughput: about 6M bit/sec	Vendor's network management software runs on PC, which connects to bridge via RS-232 port	$25,000; $8,000 for management software
	FX5520EZ	Local; 2 or 3 LAN ports (1 or 2 Ethernet, 1 FDDI)	Ethernet: AUI; FDDI: DAS (2 MICs)	NA	Motorola 68000 series CPU; VMEbus architecture; 5-slot chassis; rack-mountable	Transparent bridging for linking Ethernet and FDDI LANs; filtering based on address	Spanning Tree Protocol	Filtering: 13K packet/sec on any port; forwarding: 4K packet/sec (64-byte); address table capacity: 4,096	Vendor's network management software runs on PC, which connects to bridge via RS-232 port	$22,000 (1 Ethernet port); $5,000 for second Ethernet port; $8,000 for management software
	CC8875Z	Local; 1 Ethernet LAN port; bridged connection via backplane of vendor's Magnum100 concentrator	Ethernet; AUI	Bridged traffic can be forwarded to any LAN or WAN port configured in the concentrator (such as RS-232, T-1, DS3)	Proprietary hardware/soft-ware design; module plugs into Magnum100 concentrator	Supports bridging connection of Ethernet to vendor's concentrator; filtering based on address	None specified; a proprietary link protocol is used over remote links	Filtering: 14.88K packet/sec (for LAN/LAN or LAN/WAN); forwarding: not specified; address table capacity: 2,000	Vendor's LightWatch network management software; optional NetView/PC interface software	$17,600 (LAN-to-LAN configuration including concentrator chassis); $1,000 management software

AMD = Advanced Micro Devices, Inc.
AUI = Attachment unit interface
CSU = Channel service unit
DAS = Dual-attached station
DDN = Defense Data Network
DECmcc = DEC Management Control Center
DSU = Data service unit
EISA = Extended Industry Standard Architecture
ELM = DEC Extended LAN Manager
EMS = Element Management System
ESF = Extended superframe format
FOIRL = Fiber-optic interrepeater link

MAC = Media access control
MAU = Media access unit
MIC = Media interface connector
MMAC = Multi Media Access Center
NA = Not applicable
PPP = Point-to-Point Protocol
RARP = Reverse Address Resolution Protocol
RF = Radio frequency
SAS = Single-attached station
SMT = FDDI Station Management
SRT = Source Routing Transparent
UDP = User Datagram Protocol

This chart includes a representative selection of bridges. These vendors may offer other bridges, and other vendors not included may offer a full range of products.

SOURCE: MIER COMMUNICATIONS, INC., PRINCETON JUNCTION, N.J

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Circle Reader Service #133

Bridges (continued on page 66)

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/configuration	Operation/features	Link-level protocols supported	Performance/capacity	Management	Price
Fibronics International, Inc. Hyannis, Mass. (508) 778-0700	FX8210-SAS or DAS FDDI to 802.X Bridge	Local; 3 LAN ports (1 or 2 Ethernet, or 1 or 2 token ring, and 1 FDDI)	Ethernet: AUI and 10BaseT interfaces; token ring: DB9 connector: FDDI: MICs	Vendor offers a different bridge system for FDDI-to-T-1 bridging	Motorola 68020 CPU (25 MHz); desktop or rack-mountable	Either transparent or encapsulation bridging of Ethernet or token ring to FDDI LAN	Source Routing for token ring/FDDI; translation/Spanning Tree Protocol (or encapsulation) for Ethernet/FDDI	Filtering: maximum frame/packet rate for Ethernet, token ring and FDDI; forwarding: 2,040 token-ring frame/sec, maximum Ethernet rate (64-byte); address table capacity: 20,000	Vendor's FX8510 network management software (versions for DOS/PC or Sun/Unix); SNMP	$14,990 (1 Ethernet to FDDI, translation bridge); $28,990 (1 token ring to FDDI, source routing bridge)
Frontier Technologies, Inc. Mequon, Wis. (414) 241-4555	Super-DDN Bridge for NetWare	Remote; plugs into bus slot of PC on NetWare Ethernet LAN, 1 WAN (X.25) port	Ethernet: interface/media depends on PC node	Connects to X.25-based DDN	Software requires vendor's AdCom3-1 controller board; plugs into an AT- or EISA-bus PC on a Novell Ethernet LAN	PC/Windows-based transparent bridging software, works with vendor's plug-in board (provides WAN connection)	DDN X.25 for WAN link; uses proprietary packet routing and encapsulation technique based on UDP/IP protocols	Filtering/forwarding: not specified	None specified	Not specified
Gandalf Data, Inc. Wheeling, Ill. (708) 541-6803	Access Bridge-Remote	Remote; 1 Ethernet LAN port and 2 WAN ports	Ethernet: LAN interface is via vendor's Access Hub concentrator	RS-232, V.35, V.11 (to T-1 rate, channelized via DSU/CSU); compression over WAN links	Intel 80960 CPU (20 MHz); modular unit plugs into concentrator	Transparent bridging, connects Ethernet to 1 location via 2 WAN links or 2 locations	HDLC (used over WAN between bridges); Spanning Tree Protocol	Filtering: up to 12.5K packet/sec; forwarding: 5K packet/sec each direction (64-byte); address table capacity: 12,000	Vendor's Access Manager network management system; SNMP	$4,995
Hewlett-Packard Co. Roseville, Calif. (800) 752-0900	HP 28673A HP 10:10 LAN Bridge	Local; 2 Ethernet LAN ports	Ethernet: AUI and thin-wire interfaces	NA	AMD 29000 CPU (25 MHz); desktop, wall- or rack-mountable	Transparent bridging; filtering based on address, protocol type or user-defined 48-byte field	Spanning Tree Protocol	Filtering: 29.76K packet/sec; forwarding: 14.88K packet/sec (64-byte); address table capacity: 512	Vendor's OpenView Bridge Manager software (runs on PC); SNMP	$4,499; $1,999 for management software
	HP 28674A HP Remote Bridge	Remote; 1 Ethernet LAN and 1 WAN port	Ethernet: AUI and thin-wire interfaces	V.35 (data rates 56K to 2.084M bit/sec) fractional T-1, T-1/E-1	AMD 29000 CPU (25 MHz); desktop, wall- or rack-mountable	Transparent bridging; filtering based on address, protocol type or user-defined 48-byte field	Spanning Tree Protocol	Filtering: 29.76K packet/sec; forwarding: 14.88K packet/sec (64-byte), depending on WAN link; address table capacity: 512	Vendor's OpenView Bridge Manager software (runs on PC); SNMP	$3,999; $1,999 for management software
Hughes LAN Systems, Inc. Mountain View, Calif. (415) 966-7300	ProBridge 8033	Local; 2 Ethernet LAN ports	Ethernet: AUI and thin-wire interfaces	NA	Intel 80386 CPU (16 MHz); desktop or rack-mountable	Transparent learning bridge; filters based on address and protocol type	Spanning Tree Protocol	Filtering: 25K packet/sec; forwarding: 13K packet/sec (64-byte); address table capacity: 3,000	Local console port; vendor's LAN Systems 9100 SNMP-based network management system; SNMP	$2,995
	ProBridge 8133	Remote; 1 Ethernet LAN and 1 WAN port	Ethernet: AUI and thin-wire interfaces	RS-232, RS-449, V.35 (data rates to 2.084M bit/sec) fractional T-1, T-1/E-1 (channelized by external DSU/CSU)	Intel 80386 CPU (16 MHz); desktop or rack-mountable	Transparent learning bridge; filters based on address and protocol type	HDLC (used over WAN link between bridges); Spanning Tree Protocol	Filtering: 25K packet/sec; forwarding: 13K packet/sec (64-byte), depending on WAN link; address table capacity: 3,000	Local console port; vendor's LAN Systems 9100 SNMP-based network management system; SNMP	$3,995
IBM Research Triangle Park, N.C. (919) 543-2000	8209 LAN Bridge	Local; 2 LAN ports (1 or 2 token ring and/or 1 Ethernet)	Ethernet: AUI; token ring: DB9 connector	NA	Intel 80186 CPUs (16 MHz); configuration unspecified	Transparent bridging for token ring to Ethernet; appears as a Source Routing bridge to LAN stations for token ring-to-token ring bridging	Spanning Tree Protocol (Ethernet to token ring); Source Routing (token ring to token ring)	Filtering: 10K packet/sec for Ethernet (64-byte); forwarding: 3K packet/sec (64-byte); system throughput ranges from 3.8M to 10.3M bit/sec based on configuration and token-ring speed	Integral management servers for configuration, alarm monitoring and reporting	$6,450 base unit; $995 for Ethernet module, $1,495 for token-ring module
	IBM Token Ring Network Bridge Program Version 2.2	Local or remote; 2 token-ring ports, any mix of 4M or 4M/16M bit/sec (local), or 1 token-ring and 1 WAN port (remote)	Token ring: DB9 connectors	RS-232 (V.24), V.35, X.21, T-1	Software runs on PC/AT or PS/2; requires 2 token-ring cards or 1 LAN and 1 WAN card	Software configures PC or PS/2 as a Source Routing local or remote bridge linking 2 token-ring LANs	IBM Source Routing	Filtering: 20Kpacket/sec; forwarding: 3K packet/sec (over WAN link, 32-byte token ring packets); maximum system throughput from 1.3M (remote) to 8.2M bit/sec (local)	Vendor's LAN Network Manager	$1,595
IN-NET Corp. San Diego (619) 487-3693	FiberTalk 5000 802.3 Ethernet Bridge	Local; 2 LAN ports (1 Ethernet, 1 FDDI)	Ethernet:AUI; FDDI: DAS (2 MICs)	NA	Motorola 68020 CPUs; VMEbus architecture; desktop or rack-mountable	Transparent bridge for linking Ethernet and FDDI LANs	None specified	Filtering: 500K packet/sec (FDDI); forwarding: 9K packet/sec (Ethernet)	Vendor's FiberTalk 1000 Network Management System	$17,500; $5,000 vendor's network management system
	FiberTalk 5000 802.5 Token Ring Bridge	Local; 2 LAN ports (1 token ring, 1 FDDI)	Token ring: DB9 connectors; FDDI: DAS (2 MICs)	NA	Motorola 68020 CPUs; VMEbus architecture; desktop or rack-mountable	Bridge for linking Ethernet and FDDI LANs	None specified	Filtering: 500K packet/sec (FDDI); forwarding: 9K packet/sec (token ring)	Vendor's FiberTalk 1000 Network Management System	$17,500; $5,000 vendor's network management system
Madge Networks, Inc. San Jose, Calif. 408-441-1300	Smart 16/4 AT and 16/4 MC Bridges	Local; 2 token ring ports (4M or 16M bit/sec in any mix)	Token ring: DB9 connector or RJ-45 (for unshielded twisted-pair cabling); switch selectable	NA	Bridge consists of 2 boards that plug into AT- or MicroChannel-bus PC (286 or higher); window-based user interface	Two-board set plugs into PC for Source Routing-based bridging from token ring to token ring	Source Routing; Spanning Tree Protocol algorithm for setting up single-route broadcast routes	Filtering: 160K packet/sec (for 16M bit/sec token rings); forwarding: 8.5K packet/sec for AT-bus PC, 9.5K packet/sec for MicroChannel version (based on 28-byte packets)	Support of IBM network management protocols (such as for IBM LAN Manager) is integral; vendor's Madge Ring Manager	$3,995 for AT or MicroChannel version (2 4M/16M adapter cards; user must supply AT- or MicroChannel-bus PC)
Microcom, Inc. Norwood, Mass. (617) 551-1000	Microcom LAN Bridge (MLB)	Local/remote; up to 3 LAN ports or up to 4 WAN ports with 1 LAN port	Ethernet: AUI and thin-wire interfaces; token ring: DB9 connector (4M or 4M/16M bit/sec in any mix)	RS-232, RS-449, X.21, V.35 (all via 37-pin D-type connector); WAN data rates to 2.048M bit/sec; compression up to 4-to-1 on WAN links	Bridge consists of as many as 5 boards that plug into AT-bus PC (12 MHz or faster); each card has Motorola 68000 CPU	Modular PC plug-in board set bridges between Ethernet and token-ring LANs and/or WAN links	Spanning Tree Protocol, Source Routing and SRT, as appropriate for configuration	Filtering: 20.88K packet/sec for token ring, 14.88K packet/sec for Ethernet; estimated system throughput: 6,000 packet/sec based on 4-port configuration (minimum packet size); address table capacity 24,000	Vendor's MMS SNMP-based management station; SNMP	$3,999 (single-port Ethernet bridge, PC not included) to $15,396 (token ring bridge with 4 WAN ports, PC included)

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CSU = Channel service unit
DAS = Dual-attached station
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DECmcc = DEC Management Control Center
DSU = Data service unit
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SMT = FDDI Station Management
SRT = Source Routing Transparent
UDP = User Datagram Protocol

This chart includes a representative selection of bridges. These vendors may offer other bridges, and other vendors not included may offer a full range of products.

SOURCE: MIER COMMUNICATIONS, INC., PRINCETON JUNCTION, N.J.

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Bridges (continued on page 68)

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/features	Link-level protocols supported	Performance/capacity	Management	Price
Netronix **Petaluma, Calif.** **(707) 769-3300**	EtherMaster 100 Bridge	Local; 2 Ethernet LAN ports	Ethernet: AUI or thin-wire interfaces	NA	Intel 80387 CPU (16 MHz); desktop, optional rack-mountable	Transparent self-learning bridge, links 2 Ethernets; filters based on address and protocol types	Spanning Tree Protocol	Filtering: 25K packet/sec; sustained system throughput: to 9.8M bit/sec (1,500-byte packets); address table capacity: 4,096 per channel	SNMP	$2,990 (AUI only); $3,400 (AUI and thin-wire interfaces)
	TokenMaster 100 Token Ring Bridge	Local; 2 token-ring LAN ports (4M or 16M bit/sec in any mix)	Token ring: DB9 connectors	NA	Intel 80286 CPU (12 MHz); desktop, optional rack-mountable	Source Routing bridge for linking to token rings	Source Routing	Filtering: 38.4K or 153.6K packet/sec (4M or 16M token ring), based on 21-byte packets; system throughput: to 3.5 or 6.78M bit/sec (4M or 16M token ring), based on 2,000-byte packets	Bridge Utility program (runs on DOS PC), compatible with IBM LAN Manager	$4,950 (4M bit/sec only); $5,990 (4M/16M bit/sec)
Network Application Technology, Inc. **Campbell, Calif.** **(408) 370-4300**	LANB/100 Local Ethernet Bridge	Local; 2 Ethernet LAN ports	Ethernet: AUI (thin-wire optional)	NA	Intel 80186 CPU (16 MHz); desktop, or single board for plugging into PC AT slot	Transparent bridging between 2 Ethernets; filtering based on address and protocol types	Spanning Tree Protocol	Filtering: 24K packet/sec (aggregate), 12K packet/sec per port; forwarding: 18K packet/sec (aggregate), 10K packet/sec per port (64-byte); address table capacity: 4,000	Vendor's NMS/100E SNMP-based network management system; SNMP	$1,495 (without management); $2,495 (with network management); $200 for unit enclosure; $150 thin-wire interfaces
	LANB/200 Remote Ethernet Bridge	Remote; 1 Ethernet LAN and 1 WAN port	Ethernet: AUI (thin-wire optional)	RS-232 (V.24), RS-449/422, X.21, V.35; WAN speeds to 64K bit/sec standard, support to T-1 optional	Intel 80186 CPU (16 MHz); desktop	Transparent bridging between 2 remote Ethernets; filtering based on address and protocol types	Spanning Tree Protocol	Filtering: 12K packet/sec; forwarding sustained at 90% of WAN link speed; address table capacity: 4,000	Vendor's NMS/100E SNMP-based network management system; SNMP	$1,795 (link speed to 64K); $2,795 (link speed to 2.048M); $1,000 additional for network management
Newbridge Networks, Inc. **Herndon, Va.** **(703) 834-3600**	8230 MainSreet Ethernet Little Bridge	Local/remote; 2 LAN and up to 2 WAN ports	Ethernet: AUI, thin-wire and 10BaseT interfaces	RS-232, X.21, V.35, frame relay, T-1 (integral CSU, channelized), E-1 (G.703/G.732 channelized)	Motorola 56001 RISC CPU (to 33 MHz); desktop, wall- or rack-mountable	Transparent bridging between local and/or remote Ethernets; filtering based on address and protocol type	HDLC (used for WAN links between bridges); Spanning Tree Protocol	LAN-to-LAN filtering/forwarding: 13,900 packet/sec (27 MHz) or 14,800 packet/sec (33 MHz); address table capacity: 2,000	SNMP	$2,995; $300 to $2,950 for optional LAN and WAN interfaces
	Integral Token Ring Bridge	Remote; 1 token ring port, forwarded traffic travels to WAN ports via backplane bus of vendor's T-1 networking multiplexer	Token ring: DB9 connector (4M or 16M bit/sec, switchable)	LAN traffic can be split into up to 30 different connections; WAN ports to 2.048M bit/sec available in multiplexer system	Motorola 68020 CPU; bridge module plugs into vendor's 3600 MainStreet Bandwidth Manager	Source Routing bridge module forwards token-ring LAN data over up to 30 WAN links to other bridge modules	Source Routing	Forwarding. 2,000 packet/sec (up to 2M bit/sec of backplane bandwidth is allocated)	SNMP	$8,500 (for plug-in token-ring bridge only); multiplexer chassis, control, all other modules cost extra
Optical Data Systems **Richardson, Texas** **(214) 234-6400**	ODS 2009 and ODS 2010	Local: 2 Ethernet LAN ports	Ethernet: AUI, thin-wire, 10BaseT or fiber interfaces (single- or multimode, FOIRL)	NA	Harris Corp. RTX RISC-based CPUs; desktop, stand-alone, rack-mountable or plug-in card for vendor's concentrator chassis	Transparent bridging between Ethernet LANs; filtering based on address and protocol type	Spanning Tree Protocol	Filtering: 29.77K packet/sec (aggregate); forwarding: 14.88K packet/sec (64-byte); address table capacity: 512 (ODS 2009), or 4,096 (ODS2010)	Vendor's ODS SNMP manager; SNMP	$3,220 (for Model 2009 plug-in module with AUI); $4,900 (for Model 2010, stand-alone, with 10BaseT interface); $1,650 for vendor's PC-based SNMP manager
	ODS 8008	Local. 2 token-ring ports (both 4M/16M bit/sec)	Token ring: DB9 or optical connector (interchangeable)	NA	Rack-mountable bridge equipped with floppy drive and CRT interface; can be purchased with integral 16-port token-ring MAU	Source Routing bridge for linking token ring LANs	Source Routing	Filtering/forwarding: not available	Integral network statistics gathering, monitoring and reporting server functions	$5,500
Performance Technology **San Antonio, Texas** **(512) 349-2000**	POWERbridge II (software-only bridge)	Remote; 1 WAN port; LAN connection dependent on PC running this software bridge	LAN connection is independent of software bridge; Ethernet, token ring and Arcnet supported	Hardware dependent; RS-232 (V.24), V.35, X.21 supported; link rates not specified	Software-only bridge, runs on PC	PC-based software bridge; filters/forwards LAN traffic over WAN based on address and protocol type	Designed primarily for bridging NETBIOS over X.25 WAN	Performance based on hardware configuration; 3,000 packet/sec forwarding is achievable; 100 implicit addresses per bridge	Interactive configuration, real-time status monitoring capabilities are integral	$1,000
Persoft, Inc. **Madison, Wis.** **(608) 273-6000**	Intersect Local Bridge (software-only bridge)	Local; software supports 2 Ethernet LAN ports	Ethernet: AUI, thin-wire and 10BaseT supported (hardware dependent)	NA	Software-only bridge, runs on PC XT through 386	PC-based software bridge; filters/ forwards LAN traffic over WAN based on address	Spanning Tree Protocol	Filtering: 22K packet/sec; forwarding: varies with PC platform, from 2,000 packet/sec for 4-MHz XT to 8.28K packet/sec for 25-MHz 386 AT; address table capacity: 8,192	None	$1,495, including 2 Ethernet cards and software
Racal InterLan, Inc. **Boxborough, Mass.** **(508) 263-9929**	INX400/L	Local; 2 Ethernet LAN ports	Ethernet: AUI and thin-wire interfaces	NA	Intel 80286 CPUs (10 MHz); desktop or rack-mountable	Transparent bridging between Ethernet LANs; filtering based on address, protocol type or packet size	Spanning Tree Protocol (disabled when forwarding on packet size for network load balancing)	Filtering: 23K packet/sec (aggregate); forwarding: 12K packet/sec; address table capacity: 8,000+	Vendor's LANcentral Express SNMP-based management system; SNMP	$3,195
Racal-Milgo **Sunrise, Fla.** **(305) 846-1601**	RACALAN Net Express	Local/remote: 3 LAN and 6 WAN ports or 12 WAN ports, or 6 LAN ports	Ethernet: AUI	V.35, V.11, WAN data rates to 2.048M bit/sec	AMD 29000 RISC-based CPU (25 MHz); multislot chassis; desktop or rack-mountable	Transparent bridging between local and/or remote Ethernets; filtering based on address and protocol type	Spanning Tree Protocol (proprietary mesh topology alternately supported); proprietary HDLC used over WAN links	Filtering: 75K packet/sec (aggregate); forwarding: 30K packet/sec; address table capacity: 9,000	Integrated console; vendor's SNMP-based network management system; SNMP	$12,995 (configuration with 1 LAN and 2 WAN ports); $20,000 fully configured

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DSU = Data service unit
EISA = Extended Industry Standard Architecture
ELM = DEC Extended LAN Manager
EMS = Element Management System
ESF = Extended superframe format
FOIRL = Fiber-optic interrepeater link

MAC = Media access control
MAU = Media access unit
MIC = Media interface connector
MMAC = Multi Media Access Center
NA = Not applicable
PPP = Point-to-Point Protocol
RARP = Reverse Address Resolution Protocol
RF = Radio frequency
SAS = Single-attached station
SMT = FDDI Station Management
SRT = Source Routing Transparent
UDP = User Datagram Protocol

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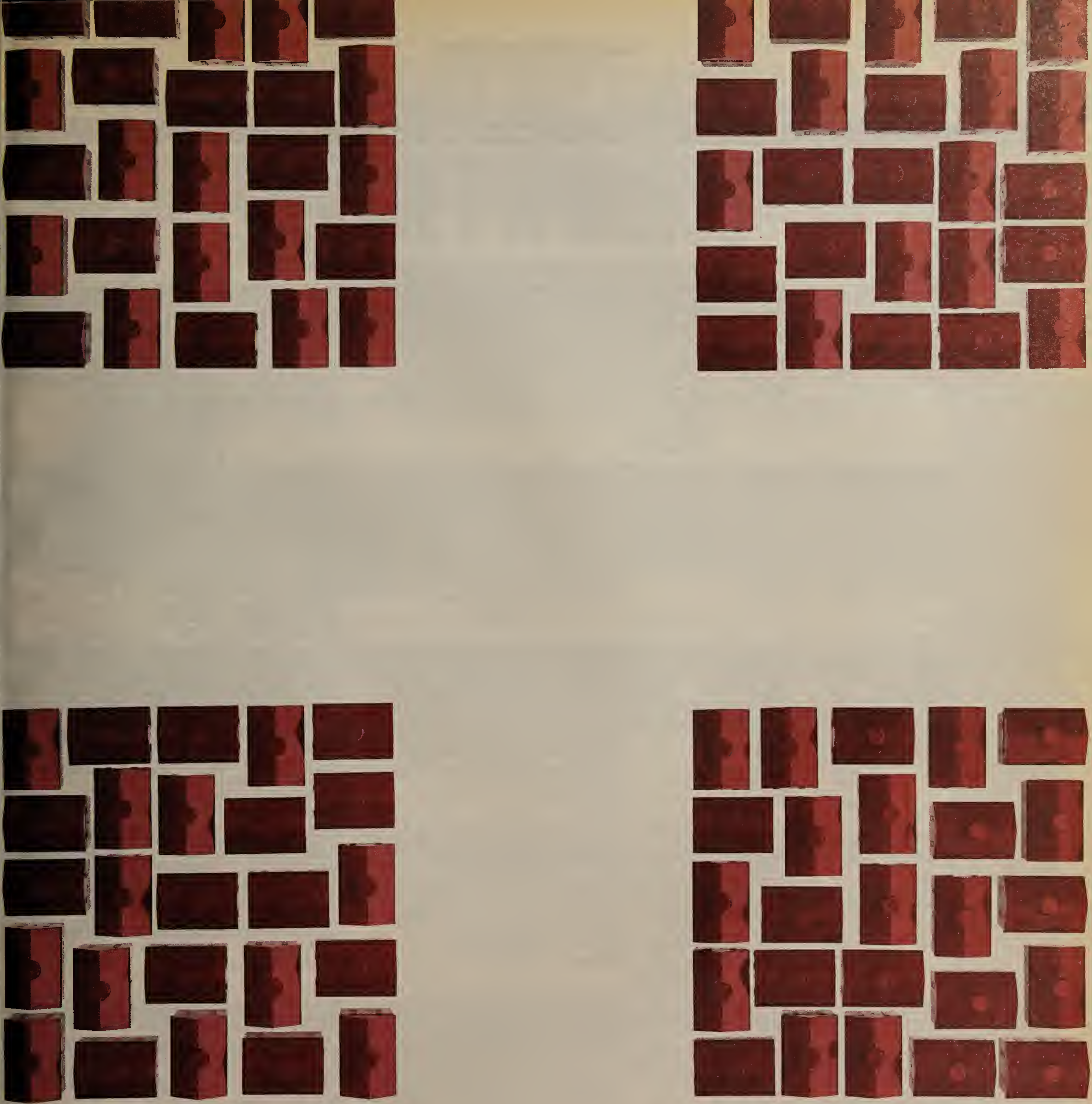
SOURCE: MIER COMMUNICATIONS, INC. PRINCETON JUNCTION, N.J.



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Bridges (continued on page 70)

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/features	Link-level protocols supported	Performance/capacity	Management	Price
RAD Network Devices, Inc. **Huntington Beach, Calif.** **(714) 891-1964**	LTB Local Token-Ring Bridge	Local; 2 token ring ports (4M or 16M bit/sec)	Token ring: DB9 connectors	NA	Motorola 68000 CPU; desktop or rack-mountable	Transparent bridging between local token ring LANs	Spanning Tree Protocol and Source Routing	Filtering: 80K packet/sec (maximum token ring); forwarding: 2.5K packet/sec (limit imposed by Texas Instruments chipset); address table capacity 2,500	Compatible with IBM LAN Manager	$3,995 to $4,995
Retix **Santa Monica, Calif.** **(213) 399-2200**	4820 Remote LAN Bridge	Remote; 1 LAN and 2 WAN ports	Ethernet: AUI and thin-wire interfaces	RS-232, RS-449, X.21, V.35; maximum 128K bit/sec WAN link speed on both ports	Motorola 68000 CPUs; desktop or rack-mountable	Transparent bridging between Ethernets over 2 WAN links, for load balancing or adaptive routing	LAP-B with error correction over WAN links; Spanning Tree Protocol	Filtering: 9K packet/sec; forwarding: 870 packet/sec (minimum to maximum packet sizes); address table capacity: 8,000	Vendor's 5025 SNMP-based Network Management Center; SNMP (optional)	$4,950 (1 LAN and 1 WAN port); second WAN port costs extra
	4850 Remote LAN bridge	Remote; 1 LAN and 2 WAN ports	Ethernet: AUI and thin-wire interfaces	RS-232, RS-449, X.21, V.35, T-1 (channelized 24 DS0s, external CSU), E-1 (G.703); maximum 2.048M bit/sec on 1 WAN port	Motorola 68000 CPUs; desktop or rack-mountable	Transparent bridging between Ethernets over 2 WAN links for load balancing or adaptive routing	LAP-B with error correction over WAN links; Spanning Tree Protocol	Filtering: 9K packet/sec; forwarding: 1,200 packet/sec (minimum to maximum packet sizes); address table capacity: 8,000	Vendor's 5025 SNMP-based Network Management Center; SNMP (optional)	$5,950 (1 LAN and 1 WAN port); T-1 option and second WAN port cost extra
	4880 Remote LAN Bridge	Remote; 1 LAN and 2 WAN ports	Ethernet: AUI and thin-wire interfaces	RS-232, RS-449, X.21, V.35, T-1 (channelized 24 DS0s, external CSU), E-1 (G.703); to 2.048M bit/sec on both WAN ports	Motorola 68020 CPUs; desktop or rack-mountable	Transparent bridging between Ethernets over two high-speed WAN links for load balancing or adaptive routing	LAP-B with error correction over WAN links; Spanning Tree Protocol	Filtering: 14.88K packet/sec; forwarding: 8K packet/sec (minimum to maximum packet sizes); address table capacity: 16,000	Vendor's 5025 SNMP-based Network Management Center; SNMP (optional)	$8,400 (1 LAN and 1 WAN port); T-1 option and second WAN port cost extra
	4660 Local LAN Bridge	Local; 2 Ethernet LAN ports	Ethernet: AUI and thin-wire interfaces	NA	Motorola 68020 CPU; desktop or rack-mountable	Transparent bridging between Ethernet LANs; filtering based on address and protocol type	Spanning Tree Protocol	Filtering: 29K packet/sec (aggregate); forwarding: 13.65K packet/sec (minimum to maximum packet sizes); address table capacity: 8,192	Vendor's 5025 SNMP-based Network Management Center; SNMP (optional)	$3,750
	220 Series Local LAN Bridges (Models 2244 and 2265)	Local; 2 Ethernet LAN ports	Ethernet: AUI (Model 2244) and thin-wire (Model 2265) interfaces; StarLan (1M bit/sec) optional	NA	Motorola 68000 CPU; desktop or rack-mountable	Transparent bridging between Ethernet LANs; filtering based on address and protocol type	Spanning Tree Protocol	Filtering: up to 12K packet/sec (aggregate); forwarding: up to 7K packet/sec (minimum to maximum packet sizes); address table capacity: 4,000	Vendor's 5025 SNMP-based Network Management Center; SNMP (optional)	$1,950
Synernetics, Inc. **North Billerica, Mass.** **(508) 670-9009**	LANplex 5004 and 5012 Network Hubs	Local; up to 88 Ethernet or up to 42 FDDI LAN ports (a multislot concentrator system)	Ethernet: primarily 10BaseT interfaces; FDDI: SAS or DAS (via MICs)	NA	Concentrator is a VMSbus system; 4-slot (Model 5004) or 12-slot (Model 5012) chassis; desktop or rack-mountable	Concentrator system designed for bridging multiple Ethernet LANs to 1 or more FDDI backbones	Translation of packet data formats between Ethernet and FDDI	Filtering: 590K packet/sec per Ethernet Express module (1 FDDI, 8 Ethernet ports); forwarding: 60K packet/sec (same module, 64-byte packets)	Port access for in-band and out-of-band management; vendor's Viewplex management system; links to IBM NetView and DEC EMA; SNMP	$24,500 (Model 5004, 2 FDDI and 8 Ethernet ports); $36,900 (Model 5012 same configuration)
SynOptics Communications, Inc. **Santa Clara, Calif.** **(408) 988-2400**	Model 3323S (AUI) and Model 3324S-ST (FOIRL) Ethernet Bridge	Local; 2 Ethernet LAN ports	Ethernet: AUI and FOIRL optical fiber interfaces (depending on model)	NA	Bridge module that plugs into slot on vendor's LattisNet System 3000 concentrator	Transparent bridging between Ethernet LANs; filtering based on address and protocol type	Spanning Tree Protocol	Filtering: 29K packet/sec (aggregate); forwarding: 14K packet/sec (64-byte); address table capacity: 8,192	Vendor's LattisNet SNMP-based network management system; SNMP	$4,795 (Model 3323S with AUI); $5,295 (Model 3324S-ST with ST fiber interfaces)
	Model 3356 Remote Ethernet Bridge	Remote; 2 WAN ports; Ethernet connection via the backplane of vendor's concentrator	Ethernet: various interface modules available with LattisNet System 3000	RS-232, V.35, X.21, RS-422/449, fractional T-1, T-1, E-1 (G.703); WAN links operate at up to 2.048M bit/sec	Bridge module that plugs into slot on vendor's LattisNet System 3000 concentrator	Remote bridging module, links Ethernet LANs to high-speed WAN links via vendor's concentrator	Spanning Tree Protocol	Filtering: 14.88K packet/sec; forwarding: 8K packet/sec (minimum to maximum packet size); address table capacity: 4,000	Local console port; Telnet control access; vendor's LattisNet SNMP-based network management system; SNMP	$11,800 (basic) to $14,600
3Com Corp. **Santa Clara, Calif.** **(408) 764-5000**	IB/3 Wide Area Ethernet and Broadband Bridge	Remote; 1 LAN port (Ethernet or broadband) and up to 4 T-1 or 8 lower speed WAN ports	Ethernet: AUI; broadband: 5M bit/sec, coaxial connection via external RF modem	RS-232, RS-422/449, V.35, T-1/E-1	Motorola 680X0 series CPUs; 4-slot chassis; desktop or rack-mountable	Transparent bridging, links Ethernet LAN (baseband or broadband) via high-speed WAN facilities	Spanning Tree Protocol	Filtering: 12K packet/sec (aggregate); system throughput: 3.7M bit/sec (any packet size); address table capacity: 8,000	Local console; Telnet control access; vendor's management system; SNMP	$9,000 (varies with number interfaces/ports supported)
	NetBuilder Bridge IB/1000	Local; 2 Ethernet LAN ports (1 baseband, 1 broadband)	Ethernet: AUI or thin-wire interfaces; broadband: 5M bit/sec, coaxial connection via external RF modem	NA	Motorola 68020 CPU; desktop or rack-mountable	Transparent bridging between local Ethernet LANs (baseband and broadband); filters based on address and protocol type	Spanning Tree Protocol: PPP	Filtering: 19.5K packet/sec (aggregate); system throughput: to 7M bit/sec (any size packet); address table capacity: 8,000	Local console; Telnet control access; vendor's management system; SNMP	$5,995
	NetBuilder Bridge IB/2000	Local; 2 Ethernet LAN ports	Ethernet: AUI and thin-wire interfaces	NA	Motorola 68020 CPU; desktop or rack-mountable	Transparent bridging between local Ethernet LANs; filters based on address and protocol type	Spanning Tree Protocol: PPP	Filtering: 19.5 packet/sec (aggregate); system throughput: to 7M bit/sec (any size packet); address table capacity: 8,000	Local console; Telnet control access; vendor's management system; SNMP	$4,995

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This chart includes a representative selection of bridges. These vendors may offer other bridges, and other vendors not included may offer a full range of products.

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Bridges (continued from page 68)

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/features	Link-level protocols supported	Performance/capacity	Management	Price
3Com Corp. (continued)	NetBuilder Bridge IB/3000	Local/remote; 4 ports (2 Ethernet LAN, 2 WAN)	Ethernet: AUI and thin-wire interfaces	RS-232, RS-449, V.35, T-1/E1	Motorola 68020 CPU; desktop or rack-mountable	Transparent bridging between local and remote Ethernet LANs; filters based on address and protocol type	Spanning Tree Protocol: PPP	Filtering: 19.5 packet/sec (aggregate); system throughput: to 7M bit/sec (any size packet); address table capacity: 8,000	Local console; Telnet control access; vendor's management system; SNMP	$7,495
Technically Elite Concepts, Inc. Hermosa Beach, Calif. (213) 379-2505	Network Professor InterChange	Local: 4 Ethernet LAN ports	Ethernet: AUI, thin-wire and 10BaseT interfaces	NA	Intel 960 RISC-based CPU; desktop or rack-mountable	Transparent bridging between multiple local Ethernets; filtering based on address, protocol type, other user-definable fields	Spanning Tree Protocol	Filtering: 14.7K packet/sec per port (58.8K packet/sec aggregate); forwarding: 29.4K packet/sec (aggregate, based on 64-byte packets); address table capacity: 56,524	SNMP	$14,750
Timeplex, Inc. Woodcliff Lake, N.J. (201) 391-1111	TIME/LAN 10 Intelligent Bridge	Local/remote: as many as 6 ports (1 or 2 LAN, as many as 5 WAN	Ethernet: AUI; token ring: DB9 connectors (4M or 16M bit/sec, 1 per system)	RS-232, RS-422/449, V.35, T-1 (channelized in DSX-1 format), E1 (G.703), fiber (ST or SMA connectors)	Intel 80286 CPU; 5-slot chassis; desktop	Transparent, Source Routing and SRT bridging; simultanteous forwarding of source and nonsource packets	Source Routing and SRT	Filtering: 10K packet/sec (Ethernet), 20K packet/sec (token ring); system throughput: 2.6K packet/sec per Ethernet (64-byte), 3M bit/sec for token ring; address table capacity 25,000	Vendor's TIME/LAN 10 EMS software for configuration, performance and status monitoring	From $8,850 (2 LAN ports) to $13,295 (2 LAN and 4 WAN ports); management software starts at $2,995
Xyplex, Inc. Boxborough, Mass. (508) 264-9930	MX3010	Local: 2 Ethernet LAN ports	Ethernet: AUI	NA	CPU not specified; desktop or rack-mountable	Transparent self-learning bridge; filters on address, protocol type and prioritization	Spanning Tree Protocol	Filtering: 29.K packet/sec (aggregate); forwarding: 11K packet/sec (64-byte); address table capacity: 2,000 standard, 8,000 special order	Local console port: remote Telnet control; SNMP	$3,995
	MX3510	Local: Ethernet 1 port; bridged Ethernet connection is via backplane of vendor's concentrator	Ethernet: AUI; interfaces for bridged LAN vary with plug-in modules for vendor's MAXserver chassis	NA	CPU not specified; module plugs into LANBUS card slot of vendor's concentrator	Transparent self-learning bridge; filters on address, protocol type and prioritization	Spanning Tree Protocol	Filtering: 29K packet/sec (aggregate); forwarding: 11K packet/sec (64-byte); address table capacity: 2,000 standard, 8,000 special order	Local console port: remote Telnet control; vendor's MAXman Network Manager for LANbus system; SNMP	$2,995

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SOURCE: MIER COMMUNICATIONS, INC., PRINCETON JUNCTION, N.J.

(continued from page 56)

either 4M or 16M bit/sec token-ring operation over a typically IBM Type 1 shielded twisted-pair cable (both twisted pairs are used in either case).

Many different packages

At one time, bridges, routers and brouters came in only one configuration: a stand-alone box. Now they can take many different forms.

While the majority of the devices listed in the charts are self-contained hardware/software platforms, both bridges and routers can also take the form of personal computer plug-in boards with accompanying software that runs as an application on the personal computer's operating system (typically DOS or 386/Unix).

This approach may seem like an inexpensive alternative, but the price that users pay includes a much reduced bridging or routing throughput. The difference can be an order of magnitude. Where personal computer-based bridges or routers may forward hundreds of packets per second, stand-alone bridges or routers — with software and hardware designs optimized solely for this function — forward thousands.

There are also a few software-only bridge and router packages available. These generally run on Unix platforms and typically provide routing functionality for the Internet Protocol, the network-layer component of TCP/IP with which routers get involved.

Some bridges, routers and brouters can be configured for either local or remote operation, and some support both traffic modes concurrently. However, many more bridge models than routers support local-only operation.

Conversely, many more routers than bridges support remote links. Fewer than 20% of the routers compared in the chart are oriented toward only LAN-to-LAN routing.

Traditionally, bridges have offered their highest throughput over direct, local, LAN-speed LAN-to-LAN connections. At one time, routers were not designed to deal with high-speed wide-area links because of their higher layer processing orientation, which involves routing decisions based on packet addresses.

Increased processor speeds and enhanced designs introduced in the past two years have enabled most bridges and routers that support remote links — which need to be deployed in pairs for remote LAN-to-remote LAN connections — to easily fill a 1.544M bit/sec T-1 link (or the European 2.048M bit/sec equivalent). In fact, many of the models in the charts can support multiple T-1 lines.

Network experts agree that the WAN link is now the prime suspect when LAN-to-LAN throughput begins to drop off. "Most often, the throughput is not restricted by the internetworking device," says Bryan Holley, director of network products for Microcom in Norwood, Mass. "Rather, network performance is usually constrained by the speed of the wide-area link. To increase network performance, an upgrade to the link speed will have the greatest effect."

> "Most often, the throughput is not restricted by the internetworking device."
>
> ▲▲▲

It takes only about 3,000 of the smallest Ethernet packet/sec to fill a T-1 line, and most of today's bridges and routers, equipped with 16- or 20-MHz 32-bit processor engines, can forward much more than that.

In fact, one of the few things that users can do when LAN-to-LAN traffic throughput gets too lethargic is to up the WAN link to a higher speed facility. If already at T-1, however, making the big leap up to T-3/DS3 is probably overkill. (T-3/DS3 service is likely to be unavailable or unaffordable anyway.)

A few of the bridges and routers listed in the tables can support and reasonably fill a T-3 link, but a user in this situation has two other options.

First, the user should consider relocating some network resources from one LAN to another. In this way, resources — whether data base servers, laser printers or whatever — will be on the same LAN segment where they are most often accessed.

Second, if one T-1 is not enough, consider two or more. The charts indicate which bridges and routers support multiple WAN links of various speeds and those that support T-1 WAN data rates.

As long as the forwarded packet throughput is more than about 5,000 packet/sec (again, typically stated for minimum-size 64-byte Ethernet packets), then two or more T-1 links can in all likelihood be kept gainfully employed.

Forwarding throughput figures were included in both the bridge and router charts when available from the vendor. In many cases where throughput was not indicated, it is apparent from the hardware configuration (for example, CPU speed) that throughput is probably not the product's strong point.

The throughput figures shown in the charts are those provided by the vendor, along with whatever pertinent qualifications were attached. These have not been independently verified, so users are advised to inquire fully about their particular configuration requirements before purchasing.

Management

Another clear trend among bridges and routers is an avalanche of support for the Simple

(continued on page 87)

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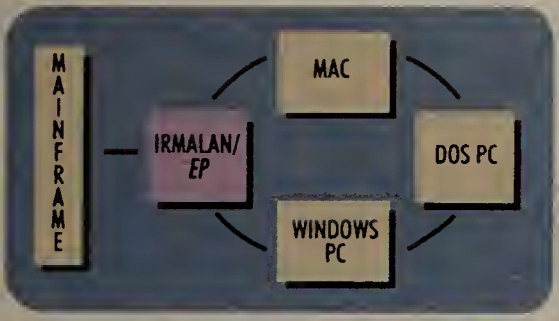

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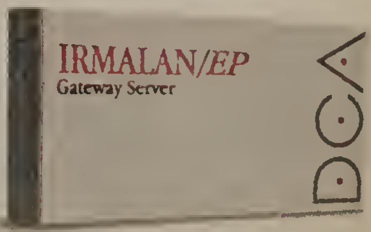

*Windows client software is not yet available for the Novell IPX/SPX protocol. ©1991 Digital Communications Associates, Inc. All rights reserved. DCA is a registered trademark and IRMALAN, MacIRMALAN, IRMA, and RamXpander are trademarks of Digital Communications Associates, Inc. All other brand and product names are trademarks or registered trademarks of their respective owner.

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Routers and combination bridge/routers (continued on page 74)

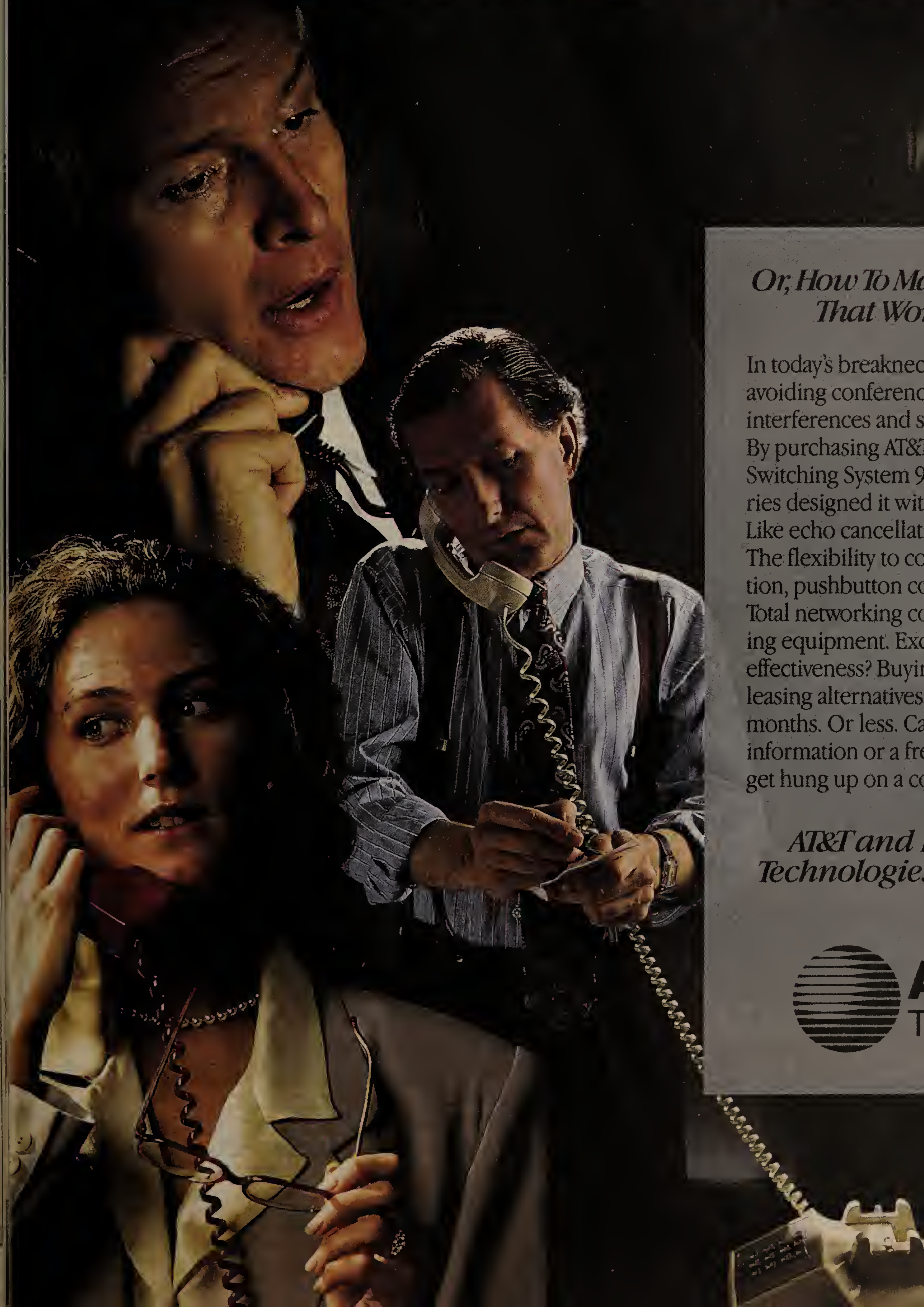
Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/ features	Protocols supported	Performance/capacity	Management	Price
Advanced Computer Communications Santa Clara, Calif. (805) 963-9431	ACS 2100	Local; 2 ports	Ethernet; AUI or thin-wire	NA	Intel Corp. 80376 (16 MHz); desktop	Dynamic routing; concurrent bridging	IP, XNS; others bridged	Routing throughput: information not available; bridge filtering/forwarding: 25K/12.5K packet/sec (64-byte); address/routing table: unlimited	Vendor's ACS 4800+ management system; SNMP	$3,250; token-ring option $1,000
	ACS 4100	Remote; 1 LAN and 2 WAN ports	Ethernet: AUI, thin-wire or 10BaseT; token ring: 4M/16M bit/sec	RS-232, V.35, RS-442, X.21, EIA-530, T-1, frame relay	Motorola, Inc. 68000 CPU (10 MHz); desktop	Static and dynamic routing; concurrent bridging	IP, IPX, XNS, Digital Equipment Corp. DECnet; others bridged; X.25; net control: RIP, OSPF, Spanning Tree Protocol	Routing throughput: 1,000 packet/sec; bridge filtering/forwarding: 8K/1,000 packet/sec (64-byte); address/routing table: unlimited	Vendor's ACS 4800+ management system; SNMP	$5,500; token-ring option $1,000
	ACS 4200	Remote; 1 LAN and 2 WAN ports	Ethernet; AUI or thin-wire	RS-232, V.35, RS-442, X.21, T-1, frame relay; network control: RIP, OSPF	Motorola 68030 CPU (25 MHz); desktop	Static and dynamic routing; concurrent bridging	IP, IPX, XNS, DECnet; others bridged; X.25; net control: RIP, OSPF, Spanning Tree Protocol	Routing throughput: 6K packet/sec; bridge filtering/forwarding: 14K/6K packet/sec (64-byte); address/routing table: unlimited	Vendor's ACS 4800+ management system; SNMP	$8,500; token-ring option $1,000
	ACS 4400	Local/remote, up to 4 LAN and 8 WAN ports	Ethernet: AUI, thin-wire or 10BaseT; token ring: 4M/16M bit/sec	RS-232, V.35, RS-442, X.21, T-1, frame relay; network control: RIP, OSPF	Intel 80376 (16 MHz) and Motorola 680X0 CPUs (10 and 25 MHz); rack-mountable	Static and dynamic routing; concurrent bridging	IP, IPX, XNS, DECnet; others bridged; X.25; net control: RIP, OSPF, Spanning Tree Protocol	Routing throughput: up to 6K packet/sec; bridge filtering/forwarding: configuration-dependent; address/routing table: unlimited	Vendor's ACS 4800+ management system; SNMP	$5,250 to $31,500 (maximum configuration); token-ring option $1,000
AT&T Computer Systems Morristown, N.J. (800) 247-1212	StarWAN Model 100 Brouter	Local or remote; 2 LAN ports (local), or 1 LAN and 1 WAN port (remote)	Ethernet: AUI	RS-232, RS-449, V.35, X.21, T-1/E-1 frame relay; 50-pin D-subminiature connector	Motorola 68020 CPU; desktop or rack-mountable	Concurrent bridging and routing; routable and nonroutable (DEC LAT) protocols can all be bridged	IP, IPX, OSI, XNS, DECnet, Apple Computer, Inc. AppleTalk and X.25 (routed); others bridged; net control: RIP, IGRP, OSPF, Spanning Tree Protocol	Routing throughput: up to 6K packet/sec; bridge filtering/forwarding: up to 6K packet/sec; address/routing table: 12M bytes for bridging, routing tables and configuration	SNMP	$5,250 to $7,295, depending on configuration
	StarWAN Model 200 Brouter	Local/remote; up to 2 LAN and 2 WAN ports	Ethernet: AUI	Various supporting 9.6K to 4.096M bit/sec, including T-1/ E-1, frame relay	Bit-slice and Motorola 68020 CPUs; desktop or rack-mountable	Concurrent bridging and routing; routable and nonroutable (DEC LAT) protocols can all be bridged	IP, IPX, OSI, XNS, DECnet, AppleTalk and X.25 (routed); others bridged; net control: RIP, IGRP, Spanning Tree Protocol; OSPF planned	Routing throughput: to 12K packet/sec; bridge filtering/forwarding: to 10K packet/sec; address/routing table: 12M bytes for bridging, routing tables and configuration	SNMP	Starts at $8,200
	StarWAN Model 400 Brouter	Local/remote; up to 8 Ethernet and/or up to 4 token ring (4M bit/sec) and/or up to 16 WAN ports (maximum 16 ports per system)	Ethernet: AUI; token ring: DB9 connector	Various supporting 9.6K to 4.096M bit/sec, including T-1/E-1, frame relay	Bit-slice and Motorola 68020 CPUs; desktop or rack-mountable	Concurrent bridging and routing; routable and nonroutable (DEC LAT) protocols can all be bridged	IP, IPX, OSI, XNS, DECnet, AppleTalk and X.25 (routed); others bridged; net control: RIP, IGRP, Spanning Tree Protocol; OSPF planned	Routing throughput: up to 20K packet/sec; bridge filtering/forwarding: up to 20K packet/sec; address/routing table: 12M bytes for bridging, routing tables and configuration	SNMP	Starts at $14,800
	StarWAN Model 450 Brouter	Local/remote; up to 12 Ethernet and/or up to 3 token ring (4M bit/sec) and up to 4 FDDI and/or up to 12 WAN ports (maximum of 28 ports per system)	Ethernet: AUI; token ring: DB9 connector; FDDI: DAS MICs	Various supporting 9.6K to 4.096M bit/sec, including T-1/E-1, frame relay	Bit-slice and Motorola 68020 CPUs; desktop or rack-mountable	Concurrent bridging and routing; routable and nonroutable (DEC LAT) protocols can all be bridged	IP, IPX, OSI, XNS, DECnet, AppleTalk and X.25 (routed); others bridged; net control: RIP, IGRP, Spanning Tree Protocol; OSPF planned	Routing throughput: to 50K packet/sec; bridge filtering: 15K packet/sec (Ethernet), 500,000 packet/sec (FDDI); address/routing table: 12M bytes for bridging, routing tables and configuration	SNMP	Starts at $18,750
Aydin Corp. Horsham. Pa. (215) 657-8600	Model 4300 Router	Local/remote; up to 14 LAN and from 2 high-speed (T-1/E-1) to 48 low-speed WAN ports	Ethernet: AUI: token ring: DB9 connector; FDDI: SAS or DAS MICs	RS-232, RS-422, X.21 (optional), T-1/E-1 (data is channelized via ISDN PRIs or BRIs)	Motorola 680X0 CPUs (up to 25 MHz); VMEbus architecture; rack-mountable or stand-alone	Static and dynamic routing, accommodates mixed protocol, mixed LAN and mixed WAN environments	IP, OSI, SNA, X.25 (all routed, net control: RIP, EGP, and OSPF	Routing throughput: to 10K packet/sec (64-byte); routing-table capacity: up to 512 subnetworks and up to 128 routes	SNMP	Starts at $7,995 (1 LAN and 1 WAN); options range from $1,250 (SNA or BSC terminal support) to $2,700 (Ethernet expansion)
Cayman Systems, Inc. Cambridge, Mass. (617) 494-1999	GatorBox CS	Local; 2 LAN ports (1 LocalTalk and 1 Ethernet)	Ethernet: AUI or thin-wire interfaces; LocalTalk: Mini-8 connector	NA	Motorola 68000 CPU; desktop, rack-mountable, or plug-in module for Cabletron MMAC	Dynamic routing and gateway processing for mixed AppleTalk, DECnet or IP environments	IP, DECnet, AppleTalk (and encapsulation of AppleTalk in IP or DECnet, and/or DECnet or IP encapsulated in AppleTalk)	Routing throughput: not specified	Serial port monitoring and diagnostics; vendor's Gator-Keeper program (runs on Macintosh); Telnet access; SNMP	$2,795 (desktop), $2,995 (rack-mountable); $1,995 for gateway software (not required for routing)
Chipcom Corp. Southborough Mass. (508) 460-8900	ONline Ethernet Router Module (adaptation of Cisco Systems, Inc. router)	Local/remote; 2 LAN ports (local) or 1 LAN and 1 WAN port (remote)	Ethernet: AUI; other interfaces via media modules and vendor's ONline Concentrator backplane	RS-232, RS-449, X.21, V.35, T-1 (via 50-pin serial port connection); WAN speeds up to 7M bit/sec	Motorola 68020 CPU (16 MHz); module that plugs into vendor's concentrator chassis	Multiprotocol concurrent bridging and routing	IP, IPX, OSI, XNS, AppleTalk, DECnet (all routed or bridged); X.25; net control: ES-IS, RIP, IGRP, EGP, others	Routing throughput: 6K packet/sec; bridge filtering: 19K packet/sec aggregate; forwarding: 6K packet/sec; address/routing-table capacity: 570K byte expandable	Interoperable with Cisco local or remote router servers; SNMP	$6,350 to $7,150; memory upgrades $200 (1M byte) to $800 (4M byte)

ARP = Address Resolution Protocol
AUI = Attachment unit interface
BRI = Basic Rate Interface
CMIP = Common Management Information Protocol
CSU = Channel service unit
DACS = Digital access and cross-connect system
DAS = Dual-attached station
DDN = Defense Data Network
DSU = Data service unit
EGP = Extended Gateway Protocol
EIA = Electronic Industries Association
ES-IS = End System to Intermediate System
ICMP = Internet Control Message Protocol
IGRP = Internet Gateway Resolution Protocol
IPX = Internetwork Packet Exchange
IS-IS = Intermediate System to Intermediate System
LAP B = Link Access Procedure B
LAT = Local Area Transport
MIC = Media interface connector
MMAC = Multi Media Access Center
NA = Not applicable
OSPF = Open Shortest Path First
PPP = Point-to-Point Protocol
PRI = Primary Rate Interface
RF = Radio frequency
RIP = Routing Information Protocol
RISC = Reduced Instruction Set Computer
RTMP = Routing Table Maintenance Protocol
SAS = Single-attached station
SMB = Microsoft's Server Message Block
SMDS = Switched Multimegabit Data Service
SNMP = Simple Network Management Protocol
SRT = Source routing transparent
VLSI = Very large-scale integration
ZIP = Zone Information Protocol

This chart includes a representative selection of vendors in the routers market. These vendors offer other routers, and other vendors not included may offer a full range of competitive products.

SOURCE: MIER COMMUNICATIONS, INC., PRINCETON JUNCTION, N.J.

Conference Coherence



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Routers and combination bridge/routers (continued on page 77)

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/ features	Protocols supported	Performance/capacity	Management	Price
Cisco Systems, Inc. **Menlo Park, Calif.** **(415) 326-1941**	IGS	Local/remote; 2 LAN ports (local) or 1 LAN and 1 WAN port (remote)	Ethernet: AUI	RS-232, RS-449, X.21, V.35, SMDS, frame relay, T-1	Motorola 68020 CPU (16 MHz); desktop or rack-mountable	Multiprotocol static and dynamic routing, concurrent bridging	IP, IPX, OSI, XNS, AppleTalk, SDLC transport, DECnet, others (all routed or bridged); X.25; net control: ES-IS, RIP, IGRP, EGP, Spanning Tree Protocol, OSPF (announced) and others	Routing throughput: 6K packet/sec; bridge forwarding: 6K packet/sec (64-byte); address/routing-table capacity: expandable (system memory to 4M bytes)	Telnet (TCP/IP) and Management Operation Protocol (DECnet) remote access; SNMP	$4,995 (2 LAN ports) to $5,495 (1 LAN, 1 WAN); software options $495 (bridging), $750 (X.25, frame relay, SMDS), $900 (LAT, gateway protocol translation)
	CGS	Local/remote; up to 4 ports (LAN and WAN)	Ethernet: AUI or thin-wire interfaces	RS-232, RS-449, X.21, V.35, SMDS, frame relay, T-1, ISDN (BRI and PRI)	Bit-slice and RISC CPUs; 4-slot, rack-mountable chassis	Multiprotocol static and dynamic routing, concurrent bridging	IP, IPX, OSI, XNS, AppleTalk, SDLC transport, DECnet, others (all routed or bridged); X.25; net control: ES-IS, RIP, IGRP, EGP, Spanning Tree Protocol, OSPF (announced) and others	Routing throughput: to 15K packet/sec; bridge forwarding: 15K packet/sec; address/routing-table capacity: expandable (system memory to 4M bytes)	Telnet (TCP/IP) and Management Operation Protocol (DECnet) remote access; SNMP	$4,775 base unit; $1,900 per Ethernet, $1,725 per serial interface
	MGS	Local/remote; up to 11 ports (LAN and WAN)	Ethernet: AUI or thin-wire interfaces; token ring: 4M or 16M bit/sec	RS-232, RS-449, X.21, V.35, SMDS, frame relay, T-1, ISDN (BRI and PRI)	Bit-slice and RISC CPUs; 4-slot, rack-mountable chassis	Multiprotocol static and dynamic routing, concurrent bridging	IP, IPX, OSI, XNS, AppleTalk, SDLC transport, DECnet, others (all routed or bridged); X.25; net control: ES-IS, RIP, IGRP, EGP, Spanning Tree Protocol, OSPF (announced) and others	Routing throughput: 6K packet/sec; bridge forwarding: 6K packet/sec (64-byte); address/routing-table capacity: expandable (system memory to 4M bytes)	Telnet (TCP/IP) and Management Operation Protocol (DECnet) remote access; SNMP	$9,275 base unit; $1,900 per Ethernet, $3,600 to $5,950 per token ring (4M or 4M/16M bit/sec), $1,725 per serial interface
	AGS+	Local/remote; up to 32 ports (combined LAN and WAN)	Ethernet: AUI or thin-wire interfaces; token ring: 4M or 4M/16M bit/sec; FDDI: SAS or DAS, single- or multimode; direct channel interfaces to IBM, UltraNet, Cray Research, Inc., others	RS-232, RS-449, V.35, SMDS, frame relay, T-1, T-3 (DS3), ISDN (BRI and PRI)	Bit-slice and very long instruction word CPUs via 0.5G bit/sec bus; 9-slot, rack-mountable chassis	Multiprotocol static and dynamic routing, concurrent bridging	IP, IPX, OSI, XNS, AppleTalk, SDLC transport, DECnet, others (all routed or bridged); X.25; net control: ES-IS, RIP, IGRP, EGP, Spanning Tree Protocol, OSPF (announced) and others	Routing throughput: to 20K packet/sec; bridge forwarding: to 20K packet/sec; address/routing-table capacity: expandable (system memory to 4M bytes)	Telnet (TCP/IP) and Management Operation Protocol (DECnet) remote access; SNMP	$12,300 base unit; $1,900 per Ethernet, $5,950 per token ring (16M bit/sec), $14,000 per FDDI interface
Compatible Systems Corp. **Boulder, Colo.** **(303) 444-9532**	EtherRoute/ TCP	Local; up to 3 LAN ports (2 LocalTalk, 1 Ethernet)	Ethernet: AUI, thin-wire or 10BaseT interfaces; LocalTalk: Mini-8 connector	NA	Intel 80C188 (10 MHz) CPU; desktop	Routing in mixed AppleTalk-TCP/IP and LocalTalk/ Ethernet environments	IP and AppleTalk; AppleTalk tunneling in IP; net control: RIP, AppleTalk RTMP and ZIP	Routing throughput: 750 packet/sec (1 Ethernet-1 LocalTalk, AppleTalk routing); routing-table capacity: 128 routes (AppleTalk), 200 (IP)	Management software included (runs on Macintosh, access via AppleTalk); SNMP planned	$1,895; $1,495 for AppleTalk protocols only
Coral Network Corp. **Marlborough, Mass.** **(800) 424-3579**	Broadband Enterprise Switch; Models CX1200 and CX1600	Local/remote; up to 3 FDDI or as many as 20 Ethernet or token-ring ports; up to 30 T-1 or 6 T-3 WAN ports	Ethernet: AUI and thin-wire interfaces; token ring: DB9 connector (4M/16M bit/sec); FDDI: DAS MICs	Fractional T-1, T-1/E-1 (routed and bridged traffic not channelized within T-1/E-1), T-3 (DS3), frame relay	Intel 80960 RISC CPU and proprietary VLSI; 10- or 16-slot stand-alone or rack-mountable chassis	Multiprotocol routing for high-speed LAN interconnection; concurrent bridging; packet-format conversion between different LANs (no encapsulation)	IP; DECnet, IPX, AppleTalk and XNS planned; HDLC, PPP and frame relay over T-1 and T-3 WAN links; net control: RIP, Spanning Tree Protocol, OSPF planned	Routing throughput: 50K packet/sec (IP routing from FDDI to T-3); bridge filtering: 400K packet/sec (system aggregate; separate bridging and routing paths through switch); routing-table capacity: 10,000 entries	Vendor's network management software (runs on Sun Microsystems, Inc.-Unix platform) is SNMP based; any manager supported via SNMP	$18,500 (2 Ethernet ports); $26,700 (2 Ethernet and 1 T-1 ports); $44,600 (configured for FDDI and T-3); $15,000 for management software
DAVID Systems. Inc. **Sunnyvale, Calif.** **(408) 720-8000**	ExpressWay WAN Server 64 Model 6515	Remote; 1 Ethernet (or any NetWare topology) port and 1 WAN port	Ethernet: supported interfaces not specified	RS-232, V.35; WAN link can be to X.25 packet network or dedicated channel (to T-1/E-1 rate)	NEC Corp. V-40 CPUs; card module that plugs into PC AT bus	Routing or bridging between NetWare LANs over WAN link	IPX; X.25; net control: Spanning Tree Protocol	Routing throughput: 5K packet/sec (64-byte); bridge filtering/ forwarding: 10K/5K packet/sec (64-byte onto a T-1)	Vendor's ExpressView SNMP-based network management; SNMP	$3,770 (IPX routing only, 64K bit/sec WAN port) to $7,465 (routing and bridging, T-1 WAN port)
	ExpressWay WAN Server 2000C Model 6217	Remote, 1 Ethernet (or any NetWare topology) port and 1 WAN port	Ethernet: supported interfaces not specified	RS-232, V.35; WAN link can be to X.25 packet network or dedicated channel (to T-1/E-1 rate)	NEC V-53 and V-50 CPUs; module that plugs into single slot of vendor's ExpressNet concentrator	Routing or bridging between NetWare LANs over WAN link	IPX; X.25; net control: Spanning Tree Protocol	Routing throughput. 14.8K packet/sec (64-byte); bridge filtering/forwarding: 14.8K/5K packet/sec (64-byte onto a T-1)	Vendor's ExpressView SNMP-based network management; SNMP	Not specified; future product planned for fourth-quarter 1991
Digital Equipment Corp. **Maynard, Mass.** **(508) 493-5111**	DECrouter 150	Remote; 1 Ethernet LAN port and 2 WAN ports	Ethernet interfaces not specified	RS-232, V.35, X.21	Motorola 68000 CPU; configuration not specified	Routing of DECnet from an Ethernet LAN over 2 WAN links	DECnet; net control: IS-IS planned	Routing throughput: 5K packet/sec; address/routing table: supports to 1,024 Level-1 nodes in 64 Level-2 DECnet Phase IV areas	Vendor's DECmcc CMIP-based network management system; SNMP	$3,200
	DECrouter 250	Remote; 1 Ethernet LAN and up to 8 WAN ports	Ethernet interfaces not specified	RS-232, V.35, X.21; up to 2 WAN ports at 64K bit/sec, up to 8 at 19.2K bit/sec	Motorola 68000 CPU; configuration not specified	Routing of DECnet from an Ethernet LAN over multiple WAN links	DECnet; net control: IS-IS planned	Routing throughput: 5K packet/sec; address/routing table: supports up to 1,024 Level 1 nodes in 64 Level 2 DECnet Phase IV areas	Vendor's DECmcc CMIP-based network management system; SNMP	$6,000

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SNMP = Simple Network Management Protocol
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VLSI = Very large-scale integration
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This chart includes a representative selection of vendors in the routers market. These vendors offer other routers, and other vendors not included may offer a full range of competitive products.

SOURCE: MIER COMMUNICATIONS, INC., PRINCETON JUNCTION, N.J.

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Network Innovators

Raymond Neff

Author, professor and the force behind Case Western Reserve University's award-winning network, Neff juggles multiple careers with aplomb.

by Salvatore Salamone

In today's age of specialization, Raymond Neff stands out as a true Renaissance man.

As vice-president for information services at Case Western Reserve University in Cleveland, Neff has led the planning, design and installation of the school's fiber-optic network: Case Western Reserve University Network (CWRUnet). When completed, CWRUnet will interconnect the university's faculty, students, classrooms, libraries and laboratories with voice, data, video, facsimile and image information resources.

For its farsighted use of networking technology, CWRUnet was selected as a finalist in the 1990 International Communications Association's Call for Innovation program.

In addition to his networking duties, Neff holds three academic positions at Case Western. He teaches biostatistics in the university's Schools of Medicine and Dentistry, as well as mathematics and statistics at Case's Institute of Technology.

Despite these demanding teaching and networking careers, Neff has still found time to write three books. His first two examined the use of biostatistical analysis to identify factors that can cause birth defects. The third book, which Neff recently completed, investigates the use of biostatistics to determine the causes of learning handicaps.

> **"To us, the network seemed to be absolutely fundamental in the university's goal to become a leading research institute," Neff says.**

Even though it seems like Neff's networking and medical research vocations have nothing in common, they are, in fact, closely related. Neff uses CWRUnet to collect and analyze vast amounts of medical information for use in his biostatistics research.

Neff's dual interests in networking and medicine surfaced at Harvard University in Cambridge, Mass., which he entered in 1965 to pursue a doctorate in biostatistics. When he left Harvard 18 years later, Neff had long since earned his degree, was lecturing on biostatistics in the university's School of Public Health and had been director of Harvard's Health Sciences Computing Facility for 11 years.

The degree and the academic appointment go together, but what was a biostatistician doing running a computer center?

"It all has to do with using information technology to solve problems," Neff says. That's been the underlying theme of his career. "I've always been interested in the applications [of information technology] and in using them in very concrete ways."

This desire to use information technology has led Neff on an interesting career path. After leaving Harvard in 1983, he held both network-related and academic positions at Dartmouth College in Hanover, N.H., and the University of California, Berkeley, before joining Case Western in 1988.

When Neff arrived at Case Western, Agnar Pytte, the university's provost and Neff's former boss at Dartmouth, challenged Neff and his group to "put Case Western on the map."

The university has a rich history of academic achievement. More than 100 years before Neff arrived, university professors Albert Michelson and Edward Morley conducted an experiment that earned them the Nobel Prize in physics. They discovered that the speed of light is constant, which was the experimental basis on which Albert Einstein later based his Theory of Relativity.

Pytte wanted Case Western to once again become a leading institute for scientific research. Seeing the benefits a scientific computing facility had brought universities such as Dartmouth and Berkeley, Pytte urged Neff to surpass those achievements. "Let's really leapfrog the other schools that are doing projects," he suggested.

"He challenged me, and I in turn challenged my staff," Neff recalls. "Someone said, 'If you're going to leapfrog, you have to know where the other frogs are,' " Neff says. "Well, I had been a 'frog' at some of those different [schools], so I knew where they were."

Knowing what other universities had done gave Neff a starting point. Also, Neff and his group thought about which scientific projects the university might be working on in the coming years, and in which areas Case Western wanted to focus its efforts.

For example, the university had decided it was not setting out to become a supercomputing center. However, scientists at Case Western would need to be able to use supercomputing facilities at other locations. "So we would need links to these other systems," Neff says.

A common link

From there, all the upcoming projects seemed to share a common need for networking. "We very quickly came up with a set of plans that not surprisingly made the network the No. 1 strategic development," Neff says. "To us, the network seemed to be absolutely fundamental in the university's goal to become a leading research institute.

"We said, 'Let's think about the network as an infrastructure that makes it possible for students and faculty, researchers, scholars and administrative staff to all interact,' " Neff says. "We wanted to set up a utility that would be ubiquitous at the university, and we wouldn't charge for it. Therefore, there would be no inhibitor to its use — at least no financial inhibitor."

This concept, Neff notes, is contrary to the customary view of a corporate information network. Such nets are often analogous to a telephone system, where network usage is metered and charged for. While those companies basically treat the network as a scarce resource, Neff says, CWRUnet would not.

After setting CWRUnet's focus, the next step was to gain support from within the university. "Having established a strategic direction for our infrastructure, we could then get other activities in the university — having nothing to do with information technology — to align their strategies with our strategies," Neff says. "We now think much more about cooperative activities within the university and with other universities because of the things we can do with the network."

Phase I of the network, which became operational in August 1989, connected the university's 16 residence halls. Phase II, completed last year, connects faculty and staff offices. The network can support existing standards such as IEEE 802.3 and 802.5, voice traffic and video distribution, all on the same fiber-optic physical layer. "Our concept was to wire once in the lifetime of the buildings," Neff says.

Neff notes that Case Western's academic departments are starting to view the network as a strategic resource — which he seems to find pleasantly surprising. "This is a buzzword we hear all the time — the network as a strategic resource," Neff says. "You tend to hear it when American Airlines [Inc.] or a large company is trying to describe what they've done, [but] you don't typically hear it in higher education. Or in education at all."

Neff himself uses CWRUnet as a strategic resource to conduct his biostatistical research. However, his main job is to manage and improve CWRUnet. Today, through his leadership, Case Western is again making news centered around the propagation of light, as it did more than 100 years ago. This time, instead of housing a Nobel Prize-winning physics experiment that measures the speed of light, the university is being praised for its innovative use of lightwave networking technology. ◼

Salamone is Network World's *features writer.*

Routers and combination bridge/routers (continued on page 78)

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/ features	Protocols supported	Performance/capacity	Management	Price
Digital	WANrouter 100	Remote; 1 Ethernet LAN port and 1 WAN port	Ethernet interfaces not specified	RS-232, V.35, X.21; maximum data rate on WAN port 64K bit/sec	Based on a MicroVAX II processor	Multiprotocol routing between 1 Ethernet LAN and 1 WAN link	OSI, IP, DECnet; X.25; net control: IS-IS	Routing throughput: information not available	Vendor's DECmcc CMIP-based network management system; SNMP	Not specified; scheduled for June 1991 introduction
	WANrouter 500	Remote; 1 Ethernet LAN port and up to 4 WAN ports	Ethernet interfaces not specified	RS-232, V.35, X.21, T-1/E-1 (maximum of 1 WAN link at T-1 rate, up to 4 at 64K bit/sec)	Based on a MicroVAX II processor	Multiprotocol routing between 1 Ethernet LAN and high-speed WAN link	OSI, IP, DECnet; X.25; net control: IS-IS	Routing throughput: information not available	Vendor's DECmcc CMIP-based network management system; SNMP	$13,500
Eicon Technology Corp. **Montreal** **(514) 631-2592**	Router for NetWare	Local/remote; plug-in cards for PC support 2 LAN ports and 1 WAN port	Ethernet: supports any NetWare LAN (configuration-dependent)	RS-232, V.35, X.21 and frame relay	Motorola 68000 CPU (16 MHz); consists of 1 or more boards that plug into AT-bus or MicroChannel-bus PC	PC-based boards and software for Novell, Inc. IPX routing, LAN-to-LAN or LAN-to-WAN	IPX; X.25; net control: none specified; address/routing table: 11 connections per router node	Routing throughput: 200 packet/sec (maximum from 1 Ethernet to V.35 WAN interface, based on 1,000-byte packets)	None	$1,095 (EiconCard hardware); $1,000 (NetWare router); these can operate concurrently with vendor's SNA and X.25 gateways
	Router for NETBIOS	Remote; 1 LAN port and up to 3 WAN ports	Any NETBIOS LAN via existing LAN hardware	RS-232, V.35 and X.21	Motorola 68000 CPU (16 MHz); consists of 1 or more boards that plug into AT- or MicroChannel-bus PC	PC-based boards and software for LAN-to-WAN static, address-based routing of NETBIOS/SMB protocol traffic	NETBIOS/SMB; X.25; net control: none specified; address/routing table: 250 addresses	Routing throughput: 200 packet/sec (maximum from 1 Ethernet to V.35 WAN interface, based on 1,000-byte packets)	None	$1,095 (EiconCard hardware); $1,400 (NETBIOS router); these can operate concurrently with vendor's SNA and X.25 gateways
Fibronics International, Inc. **Hyannis, Mass.** **(508) 778-0700**	FX8310 Router/Bridge	Local; 1 or 2 Ethernet ports and 1 FDDI port	Ethernet: AUI; FDDI: SAS or DAS via MICs	NA	Intel 960 CPU (33 MHz); desktop or rack-mountable	Concurrent routing and bridging between local Ethernets and FDDI LANs	IP, DECnet (always routed, all others are bridged); net control: RIP, Spanning Tree Protocol	Routing or bridging throughput: 14K packet/sec (64-byte); bridge filtering: 446K packet/sec (full FDDI), 14K packet/sec (full Ethernet)	Vendor's proprietary network management system; SNMP	$27,500 (1 Ethernet, 1 FDDI); $32,500 (2 Ethernet, 1 FDDI)
Gateway Communications, Inc. **Irvine, Calif.** **(714) 553-1555**	G/Remote Bridge and G/Remote Bridge 64	Remote; up to 2 LAN and 3 WAN boards per host PC (limit Is PC's 5-slot chassis)	Dependent on PC configuration; Ethernet, token ring and Arcnet supported	RS-232, RS-422, V.35; WAN data rate to 19.2K or 64K bit/sec, depending on model; 4-to-1 compression over WAN link	Zilog Z80 or Intel 80186 CPU (depending on model); card modules plug into AT-bus PC	PC-based boards and software for routing Novell IPX traffic over WAN links	IPX; X.25; net control: none	Routing throughput: not specified; address/routing table: 250 users per router, 64 remote LANs	Integral monitoring of connections and link status on local or remote PC	$1,595 (board supporting 2 WAN links to 19.2K bit/sec); $2,495 (1 WAN link to 64K bit/sec)
	G/X25 Gateway and G/X25 Gateway 64	Remote; up to 2 LAN and 3 WAN boards per host PC (limit is PC's 5-slot chassis)	Dependent on PC configuration; Ethernet, token ring and Arcnet supported	RS-232, RS-422, V.35; WAN data rate to 19.2K or 64K bit/sec, depending on model; 4-to-1 compression over WAN link	Intel 80186 CPU (depending on model); card modules plug into AT-bus PC	PC-based boards and software for routing Novell IPX traffic over X.25 WAN links	IPX; X.25, including 27 terminal emulators; net control: none	Routing throughput: not specified; address/routing table: 250 users per router, 64 remote LANs	Integral monitoring of connections and link status on local or remote PC	$1,895 (board supporting 1 WAN link to 19.2K bit/sec); $2,995 (1 WAN link to 64K bit/sec); $2,495 to $3,495 (combined X.25 gateway, bridge and LAN-to-LAN IPX routing)
	G/SNA Gateway	Remote; 1 WAN port; LAN interface is separate and depends on PC configuration	LAN interface is acquired separately for PC and is not directly related to this board	RS-232 (V.24), RS-422, V.35; WAN data rate to 64K bit/sec	Intel 80186 CPU; card modules plug into AT-bus PC	PC-based board and software for routing Novell IPX, bridging NETBIOS, or gateway processing for LAN traffic over SNA/SDLC WAN links	IPX; SNA/SDLC (IPX, SNA and NETBIOS can alternately all be bridged); net control: none	Routing throughput: not specified; address/routing table: 128 concurrent sessions per link	Integral monitoring of connections and link status on local or remote PC	$2,580 to $4,580, depending on number of SNA sessions supported
Hewlett-Packard Co. **Roseville, Calif.** **(600) 752-0900**	HP Router HP27270A	Local/remote; up to 16 ports (mix of Ethernet LAN and WAN ports)	Ethernet: AUI	RS-232, RS-449, X.21, V.35, T-1/E-1; all WAN ports can operate at up to 2.048M bit/sec	Motorola 68020 CPUs (25 MHz); VMEbus architecture; desktop or rack-mountable	Multiprotocol router, will bridge any protocol that cannot be routed; for multi-LAN local and remote environments	IP, DECnet, IPX, XNS, AppleTalk; X.25 (and HDLC for WAN links); net control: RIP, EGP, Spanning Tree Protocol, (OSPF and IS-IS planned)	Routing throughput: 13.6K packet/sec (64-byte IP); address/routing table: 8,999 addresses (bridging); 1M byte for routing tables (combined for all supported protocols)	Local console terminal; remote Telnet control; vendor's OpenView SNMP-based management system; SNMP	$13,000 (2 LAN ports, IP and IPX routing, and bridging) to $43,000 (8 LAN and 8 WAN ports); $1,100 each additional protocol
	HP Router ER HP 27285A	Remote; 2 Ethernet LAN and 2 WAN ports	Ethernet: AUI	RS-232, RS-449, X.21, V.35, T-1/E-1; all WAN ports can operate at up to 2.048M bit/sec	Motorola 68020 CPU (25 MHz); desktop, wall- or rack-mountable	Multiprotocol router, will bridge any protocol that cannot be routed; for multi-LAN local and remote environments	IP, DECnet, IPX, XNS, AppleTalk; X.25 (and HDLC for WAN links); net control: RIP, EGP, Spanning Tree Protocol, (OSPF and IS-IS planned)	Routing throughput: 11.9K packet/sec (64-byte IP); address/routing table: 8,999 addresses (bridging); 1M byte for route tables (combined for all supported protocols)	Local console terminal; remote Telnet control; vendor's OpenView SNMP-based management system; SNMP	$9,000
Micro Tempus Corp. **Waltham, Mass.** **(617) 899-4046**	Enterprise Router (software only, runs on IBM MVS host)	Remote; software routes over SNA network configuration, depending on host	Supports PC nodes on Microsoft Corp. LAN Manager-based Ethernet and token ring	SNA network via VTAM; depends on host configuration	Software only; written in C language, modules run on MVS/VTAM hosts and DOS or OS/2 PCs	A software-based NETBIOS router that connects multiple LANs via an IBM mainframe	NETBIOS/SMB; X.25; SNA	Routing throughput: depends on SNA hardware configuration; routing table: dynamically maintained on host	None integral	$28,000 to $117,000 for host router software, depending on processor slze; $1,590 unlimited PC license

ARP = Address Resolution Protocol
AUI = Attachment unit interface
BRI = Basic Rate Interface
CMIP = Common Management Information Protocol
CSU = Channel service unit
DACS = Digital access and cross-connect system
DAS = Dual-attached station
DDN = Defense Data Network
DSU = Data service unit
EGP = Extended Gateway Protocol
EIA = Electronic Industries Association
ES-IS = End System to Intermediate System
ICMP = Internet Control Message Protocol
IGRP = Internet Gateway Resolution Protocol
IPX = Internetwork Packet Exchange
IS-IS = Intermediate System to Intermediate System
LAP B = Link Access Procedure B
LAT = Local Area Transport
MIC = Media interface connector
MMAC = Multi Media Access Center
NA = Not applicable
OSPF = Open Shortest Path First
PPP = Point-to-Point Protocol
PRI = Primary Rate Interface
RF = Radio frequency
RIP = Routing Information Protocol
RISC = Reduced Instruction Set Computer
RTMP = Routing Table Maintenance Protocol
SAS = Single-attached station
SMB = Microsoft's Server Message Block
SMDS = Switched Multimegabit Data Service
SNMP = Simple Network Management Protocol
SRT = Source routing transparent
VLSI = Very large-scale integration
ZIP = Zone Information Protocol

This chart includes a representative selection of vendors in the routers market. These vendors offer other routers, and other vendors not included may offer a full range of competitive products.

SOURCE: MIER COMMUNICATIONS, INC., PRINCETON JUNCTION, N.J.

Routers and combination bridge/routers (continued on page 80)

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/ features	Protocols supported	Performance/capacity	Management	Price
Newport Systems Solutions, Inc. **Newport Beach, Calif.** **(714) 752-1511**	LAN^{2}LAN/ Compression Router	Remote; 2 WAN ports; LAN interface is separate and depends on PC configuration	Any NetWare LAN; interface depends on PC configuration; Ethernet, Arcnet, token ring supported	RS-232,RS-422, X.21, V.35; WAN links to 128K bit/sec; compression to 4-to-1 on WAN links	NEC V50 CPU (10 MHz); board module that plugs into AT-bus PC	PC-based, board level, multiprotocol router	IP, IPX, AppleTalk; X.25 (and HDLC over point-to-point LAN links); net control: RIP, ARP, NetWare and AppleTalk routing protocols	Routing throughput: 196 packet/sec (576-byte, over 128K bit/sec WAN interface using 4.2-to-1 compression)	Vendor's management software package (runs on router PC); automatic alternate routing and link restoration	$3,995 (2 WAN ports to 128K bit/sec); AT- or MicroChannel-bus models; units required at both ends of WAN links
	LAN^{2}LAN/ 768 Router	Remote; 4 WAN ports; LAN interface is separate and depends on PC configuration	Any NetWare LAN; interface depends on PC configuration; Ethernet, Arcnet, token ring supported	RS-232,RS-422, X.21, V.35, T-1/E-1 (channelized via external DSU/mux); WAN links to 2.048M bit/sec	NEC V50 CPU (10 MHz); board module that plugs into AT- or MicroChannel-bus PC	PC-based, board-level, multiprotocol router	IP, IPX, AppleTalk; X.25 (and HDLC over point-to-point LAN links); net control: RIP, ARP, NetWare and AppleTalk routing protocols	Routing throughput: 325 packet/sec (576-byte, between Ethernet and 768K bit/sec WAN interface)	Vendor's management software package (runs on router PC); load balancing, automatic alternate routing and link restoration on WAN links	$5,195 (2 WAN ports to 2.048M bit/sec); AT- or MicroChannel-bus models; units required at both ends of WAN links
	LAN^{2}LAN/ Mega Router	Remote; 2 WAN ports; LAN interface is separate and depends on PC configuration	Any NetWare LAN; interface depends on PC configuration; Ethernet, Arcnet, token ring supported	RS-232,RS-422, X.21, V.35, T-1/E-1 (channelized via external DSU/mux); WAN links to 2.048M bit/sec	NEC V50 CPU (10 MHz); board module that plugs into AT- or MicroChannel-bus PC	PC-based, board level, multiprotocol router	IP, IPX, AppleTalk; X.25 (and HDLC over point-to-point LAN links); net control: RIP, ARP, NetWare and AppleTalk routing protocols	Routing throughput: 648 packet/sec (576-byte, between Ethernet and T-1 WAN interface)	Vendor's management software package (runs on router PC); load balancing, automatic alternate routing and link restoration on WAN links	$5,195 (2 WAN ports to 2.048M bit/sec); AT- or MicroChannel-bus models; units required at both ends of WAN links
Phaser Systems, Inc. **South San Francisco** **(415) 952-6300**	NetWare SNA Router (software-only product)	Remote; SNA WAN and LAN interfaces are dependent on PC configuration	LAN interface is acquired separately for PC and not directly related to this software	Hardware-dependent	Software runs on PC or PS/2, 286 or greater CPU recommended	PC-based software for routing/ bridging Novell IPX and NETBIOS (Novell's emulation) over SNA/SDLC WAN links	IPX, NETBIOS; SNA/SDLC (LU 6.2/PU 2.1) over WAN links; net control: Novell routing protocols, Spanning Tree Protocol and Source Routing	Routing throughput: hardware-dependent; address/routing table: 5 LANs by routing protocols, unlimited number of routes	All NetWare-supported utilities and third-party management products based on either NETBIOS or IPX	$2,895 per NetWare 286-based LAN, $3,495 per NetWare 386-based LAN
	NetWare for MVS and VM (software-only product)	Remote; SNA WAN and LAN interfaces are dependent on IBM host configuration	Software runs on IBM S/370 platform, supports all NetWare topologies	SNA network support required, not included	Software runs on S/370 and compatible mainframes; versions for MVS and VM environments available	IBM host-based software provides NetWare routing support for IBM SNA environments	IPX, NETBIOS; SNA/SDLC (LU 0, LU 2 or LU 6.2/ PU 2.0) over WAN links; net control: Novell routing protocols, Spanning Tree Protocol and Source Routing	Routing throughput: hardware-dependent; address/routing table: 299 LANs by routing protocols and address entries, unlimited number of routes	All NetWare-supported utilities and third-party management products based on either NETBIOS or IPX	$20,000 to $95,000, depending on mainframe class
Proteon, Inc. **Westborough, Mass.** **(508) 898-2800**	CNX 500 RISC Router	Local/remote; up to 6 ports (combination of LAN and WAN)	Ethernet: AUI and thin-wire interfaces; token ring: 4M or 16M bit/sec via DB9 connectors; FDDI: DAS or SAS via MICs	RS-232, RS-449, V.35, X.21, frame relay, T-1/E-1	AMD 29000 CPU (25 MHz); desktop or rack-mountable	Concurrent multiprotocol routing and bridging for Ethernet, token ring and FDDI environments	IP, IPX, DECnet, XNS, OSI, AppleTalk, Apollo Division of HP Domain; X.25; PPP; net control: RIP (IP and XNS), EGP, OSPF, DECnet, Spanning Tree Protocol, Source Routing, others	Routing throughput: 6K packet/sec (Ethernet to 2M bit/sec WAN port, 64-byte); bridge filtering/forwarding: 15K/15K packet/sec (64-byte); routing-table capacity: 1M byte	Vendor's OverVIEW SNMP-based management system; DECema-manageable; SNMP	$10,995 to $19,995, depending on configuration
	p4100+ Bridging Router	Local/remote; up to 4 ports (combination of LAN and WAN)	Ethernet: AUI and thin-wire interfaces; token ring: 4M or 16M bit/sec via DB9 connectors; Apollo token ring and Proteon ProNET 10	RS-232, RS-449, V.35, T-1	Intel 80386 CPU (20 MHz); multislot chassis	Concurrent multiprotocol routing and bridging for Ethernet and token-ring environments	IP, IPX, DECnet, XNS, OSI, AppleTalk, Apollo Domain; X.25; net control: RIP (IP and XNS), EGP, OSPF, DECnet, Spanning Tree Protocol, Source Routing and others	Routing throughput: 3K to 4K packet/sec; bridge filtering/forwarding: 15K/3K to 4K packet/sec (64-byte); routing-table capacity: 1M byte	Vendor's OverVIEW SNMP-based management system; DECema-manageable; SNMP	$6,995 (2 token-ring ports, Source Routing); $7,695 (1 Ethernet and 2 WAN ports, IP and IPX routing)
	p4200 FDDI Router	Local/remote; up to 14 ports (combination of LAN and WAN)	Ethernet: AUI and thin-wire interfaces; token ring: 4M or 16M bit/sec; FDDI: DAS or SAS; Proteon ProNET 10 and 80	RS-232, RS-422/ 449, V.35, T-1, IEEE 802.6 MAN	Motorola 68020 CPU (16 MHz); 9-slot chassis	Concurrent multiprotocol routing for Ethernet and token-ring environments	IP, IPX, DECnet, XNS, OSI, AppleTalk, Apollo Domain; X.25; net control: RIP (IP, XNS and NetWare), OSPF, ES-IS, others	Routing throughput: 4K to 6K packet/sec; routing-table capacity: 1M byte	Vendor's OverVIEW SNMP-based management system; DECema-manageable; SNMP	$12,450 (2 Ethernet ports and IP routing)
RAD Network Devices, Inc. **Huntington Beach, Calif.** **(714) 891-1964**	RTB-10, -20 and -30 Remote Token Ring Bridge/Routers	Remote; 1 token ring (4M bit/sec only) and from 1 to 4 WAN ports (depending on model)	Token ring: via DB9 connector	RS-422/499, V.35, X.21; optional T-1, E-1 (G.703) or fiber-optic interfaces; WAN link speeds to 2.048M bit/sec	Intel 80186-based card set that plugs into AT-bus-based PC platform	Modular, PC-based, plug-in board set for routing/ bridging between remote token-ring LANs	Routed protocols not specified; Source Routing applied to all routed traffic; HDLC used over WAN links between routers	Routing throughput: 2.5K packet/sec (based on 100-byte); bridge filtering/forwarding: 40K/2.5K packet/sec; address/routing table: 25,000 entries	Management module is optional; load balancing and load sharing over WAN links	$5,995 (1 WAN port, model RTB-10); $7,950 (2 WAN ports, model RTB-20); $8,950 (4 WAN ports, Model RTB-40)
	XEB X.25 Ethernet Bridge/Router	Remote; 1 Ethernet LAN port and from 1 to 4 WAN ports (depending on model)	Ethernet: AUI	RS-422/499, V.35, X.21; optional T-1, E-1 (G.703) or fiber-optic interfaces; WAN link speeds to 2.048M bit/sec; at least 1 WAN port is X.25	Intel 80186-based card set that plugs into AT-bus-based PC platform	Modular, PC-based, plug-in board set for routing/ bridging between remote Ethernet LANs via X.25 and leased-line WAN links	Routed protocols not specified; protocol transparent bridging; HDLC used over WAN links between routers	Routing throughput: 2.6K packet/sec; bridge filtering/forwarding: 10K/2.6K packet/sec; address/routing table: 25,000 entries	Management module is optional; load balancing and load sharing over WAN links	$7,950 (1 X.25 WAN link only, Model XEB-1) to $12,845 (4 serial and 1 X.25 WAN links, Model XEB-5)

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DACS = Digital access and cross-connect system
DAS = Dual-attached station
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ICMP = Internet Control Message Protocol
IGRP = Internet Gateway Resolution Protocol
IPX = Internetwork Packet Exchange
IS-IS = Intermediate System to Intermediate System
LAP B = Link Access Procedure B
LAT = Local Area Transport
MIC = Media interface connector
MMAC = Multi Media Access Center
NA = Not applicable
OSPF = Open Shortest Path First
PPP = Point-to-Point Protocol
PRI = Primary Rate Interface
RF = Radio frequency
RIP = Routing Information Protocol
RISC = Reduced Instruction Set Computer
RTMP = Routing Table Maintenance Protocol
SAS = Single-attached station
SMB = Microsoft's Server Message Block
SMDS = Switched Multimegabit Data Service
SNMP = Simple Network Management Protocol
SRT = Source routing transparent
VLSI = Very large-scale integration
ZIP = Zone Information Protocol

This chart includes a representative selection of vendors in the routers market. These vendors offer other routers, and other vendors not included may offer a full range of competitive products.

SOURCE: MIER COMMUNICATIONS, INC., PRINCETON JUNCTION, N.J.

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TIME LAN

Circle Reader Service #112

Routers and combination bridge/routers (continued on page 86)

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/ features	Protocols supported	Performance/capacity	Management	Price
RAD Network Devices	Remote Ethernet Bridge/Router (REB) and Composite Ethernet Bridge/Router (CEB)	Remote; 1 or 2 Ethernet LAN ports and from 1 to 4 WAN ports	Ethernet: AUI	RS-422/499, V.35, X.21; optional T-1, E-1 (G.703) or fiber-optic interfaces; WAN link speeds to 2.048M bit/sec	Intel 80186-based card set that plugs into AT-bus-based PC platform	Modular, PC-based, plug-in board set for routing/ bridging between remote Ethernet LANs	Routed protocols not specified; protocol-transparent bridging; HDLC used over WAN links between routers	Routing throughput: 2.6K packet/sec; bridge filtering/forwarding: 10K/2.6K packet/sec; address/routing table: 25,000 entries	Management module is optional; load balancing and load sharing over WAN links	$3,995 (1 LAN and 1 WAN port, Model REB-S1) to $10,995 (2 LAN and 4 WAN ports, Model CEB-40)
Retix **Santa Monica, Calif.** **(213) 399-2200**	4941 Remote Bridge/Router	Remote; 2 ports (1 Ethernet LAN, 1 WAN)	Ethernet: AUI and thin-wire interfaces	X.21, V.35, RS-449, T-1 (channelized via external CSU), E-1 (G.703); to 2.048M bit/sec on both WAN links	Motorola 68020 CPUs; rack-mountable	IP routing and concurrent bridging of all protocols; for linking remote Ethernet LANs	IP only; LAP B with error detection (used over WAN links between routers); net control: RIP, Spanning Tree Protocol	Routing throughput: 3.5K packet/sec; bridge filtering/forwarding: 14.88K/8K packet/sec (minimum to maximum packet size); address table capacity: 3,000	Adaptive routing and load balancing on WAN links; CMIP; SNMP	$6,250; T-1 option extra
	4942 Remote Bridge/Router	Remote; 3 ports (1 Ethernet LAN, 2 WAN)	Ethernet: AUI and thin-wire interfaces	X.21, V.35, RS-449, T-1 (channelized via external CSU), E-1 (G.703); to 2.048M bit/sec on both WAN links	Motorola 68020 CPUs; rack-mountable	IP routing and concurrent bridging of all protocols; for linking remote Ethernet LANs	IP only; LAP B with error detection (used over WAN links between routers); net control: RIP, Spanning Tree Protocol	Routing throughput: 3.5K packet/sec (single LAN, single WAN); bridge filtering/ forwarding: 14.88K/8K packet/sec (minimum to maximum packet size); address table capacity: 3,000	Adaptive routing and load balancing on WAN links; CMIP; SNMP	$8,900 (single WAN port); second WAN port, T-1 are extra options
Shiva Corp. **Cambridge, Mass.** **(617) 252-6300**	EtherGate	Local/remote; 3 ports (1 Ethernet, 2 LocalTalk LAN or serial WAN)	Ethernet: AUI or thin-wire Interfaces; LocalTalk: Mini-8 connectors	RS-232 (in lieu of one or both LocalTalk LAN ports); WAN links to 57.6K bit/sec	Motorola 68000 CPU (10 MHz); desktop	Router for linking AppleTalk nodes on Ethernet, LocalTalk or remotely via RS-232 link	AppleTalk only (via Ethernet or LocalTalk); AppleTalk routing and remote access protocols	Routing throughput: system aggregate is constrained by LocalTalk and remote link speed	Vendor's Internet Manager software is integral; AppleTalk management protocols	$1,899
	NetBridge	Local; 2 Apple LocalTalk ports	LocalTalk; Mini-8 connectors	NA	8-bit 8051 CPU (11 MHz); desktop	AppleTalk router links nodes to LocalTalk segments	AppleTalk only; AppleTalk routing and remote access protocols	Routing throughput: system aggregate is constrained by LocalTalk	Vendor's Internet Manager software is integral; AppleTalk management protocols	$599
	FastPath 4	Local; 2 ports (1 Ethernet, 1 LocalTalk)	Ethernet: AUI or thin-wire interfaces (switchable); AppleTalk: Mini-8 connector	NA	Motorola 68000 CPU (8 MHz); desktop	Mulitprotocol router for linking LocalTalk and Ethernet LANs; software supports gateway processing	AppleTalk, DECnet, IP (including AppleTalk encapsulation within IP)	Routing throughput: not specified	Typically via LocalTalk-connected Macintosh; SNMP	$2,795
SynOptics Communications, Inc. **Santa Clara, Calif.** **(408) 988-2400**	Model 3383/3384 Local Ethernet Router	Local; 2 Ethernet: LAN ports; module that plugs into vendor's LattisNet 3000 concentrator	Ethernet: AUI, thin-wire, 10BaseT or fiber (FOIRL) interfaces	NA	Plug-in module; connections can be established via backplane of LattisNet concentrator	Multiprotocol routing and concurrent bridging between local Ethernets	IP, OSI, XNS, DECnet, AppleTalk, Apollo Domain, others (all routed); net control: RIP, IGRP, ES-IS, Spanning Tree Protocol	Routing throughput: 5K packet/sec; bridge filtering/forwarding: 15K/5K packet/sec	Vendor's LattisNet SNMP-based network management system is integral; SNMP	$6,395 to $6,795, oepending on options (router module only; all concentrator components are extra)
	Model 3386 Remote Ethernet Router	Remote; LAN and WAN ports, depend on media modules configured with vendor's concentrator	Ethernet: system Interface modules support AUI, thin-wire, 10BaseT or fiber (FOIRL) interfaces	WAN interface modules support RS-232, RS-449, V.35, X.21, frame relay, T-1/E-1; WAN link speeds supported to 2.048M bit/sec	Plug-in module; connections can be established via backplane of LattisNet concentrator	Multiprotocol routing and concurrent bridging between remote Ethernets via WAN links	IP, OSI, XNS, DECnet, AppleTalk, Apollo Domain, others (all routed); X.25; net control: RIP, IGRP, ES-IS, Spanning Tree Protocol	Routing throughput: 5K packet/sec (system aggregate); bridge filtering/forwarding: 15K/5K packet/sec	Vendor's LattisNet SNMP-based network management system is Integral, includes Telnet control; SNMP	$6,995 to $8,295, depending on options (router module only; all concentrator components are extra)
Systems Strategies, Inc. **New York** **(212) 279-8400**	Express IP Router (software-only product)	Local/remote; software supports to 8 WAN ports; number of LAN ports depends on hardware platform	LAN interfaces vary and depend on Unix platform configuration	Software supports up to 8 WAN ports, each up to 64K bit/sec if supported on Unix 386 system	Software router; runs on Unix 386 system; LAN/WAN interfaces (not included) are AT-or MicroChannel-bus cards	IP router software for Unix 386 system; supports LAN and WAN connections	IP only; X.25 over WAN links; net control: standard TCP/IP	Routing throughput: software can utilize a 64K bit/sec X.25 link at 95%; routing table is static, size limited to storage capacity of system	Standard TCP/IP management supported	$700; also requires vendor's X.25 software, which costs $1,000, and at least 1 synchronous WAN interface board ($1,500-plus)
3Com Corp. **Santa Clara, Calif.** **(408) 764-5000**	BR/3 Wide Area Ethernet & Broadband Bridge/Router	Remote; baseband or broadband Ethernet LAN, multiple WAN ports	Ethernet: AUI or broadband (5M bit/sec via external RF modem) interfaces	RS-232, RS-422, RS-449, V.35, fractional T-1; maximum of WAN link speed 2.048M bit/sec; up to 8 lower speed WAN links	Motorola 680X0 CPUs; multislot chassis; desktop or rack-mountable	Concurrent bridging and routing for linking multiple local and remote Ethernet LANs	IP, XNS (routed protocols are not bridged); net control: RIP, ICMP, ARP, OSPF, IS-IS, DECnet, Spanning Tree Protocol	Routing throughput: 1K packet/sec (single LAN, single WAN, single protocol); bridge filtering/forwarding: not specified	Vendor's network control server; Telnet control access; SNMP	$9,500 (configuration not specified)
	BR/1000 Local Broadband Bridge/Router	Local; 2 Ethernet LAN ports (baseband or broadband)	Ethernet: AUI or thin-wire interfaces, or broadband (5M bit/sec via external RF modem)	NA	Motorola 68020 CPU; desktop or rack-mountable	Concurrent bridging and routing for linking local Ethernet LANs	IP, IPX, XNS, OSI, DECnet (all routed or bridged); net control: RIP, ICMP, ARP, OSPF, IS-IS, DECnet, Spanning Tree Protocol	Routing throughput: 6.4K packet/sec (LAN-to-LAN, single protocol); bridge forwarding: 10K packet/sec	Vendor's network control server; Telnet control access; SNMP	$6,495 (configuration not specified)

ARP = Address Resolution Protocol
AUI = Attachment unit interface
BRI = Basic Rate Interface
CMIP = Common Management Information Protocol
CSU = Channel service unit
DACS = Digital access and cross-connect system
DAS = Dual-attached station
DDN = Defense Data Network
DSU = Data service unit
EGP = Extended Gateway Protocol
EIA = Electronic Industries Association
ES-IS = End System to Intermediate System
ICMP = Internet Control Message Protocol
IGRP = Internet Gateway Resolution Protocol
IPX = Internetwork Packet Exchange
IS-IS = Intermediate System to Intermediate System
LAP B = Link Access Procedure B
LAT = Local Area Transport
MIC = Media interface connector
MMAC = Multi Media Access Center
NA = Not applicable
OSPF = Open Shortest Path First
PPP = Point-to-Point Protocol
PRI = Primary Rate Interface
RF = Radio frequency
RIP = Routing Information Protocol
RISC = Reduced Instruction Set Computer
RTMP = Routing Table Maintenance Protocol
SAS = Single-attached station
SMB = Microsoft's Server Message Block
SMDS = Switched Multimegabit Data Service
SNMP = Simple Network Management Protocol
SRT = Source routing transparent
VLSI = Very large-scale integration
ZIP = Zone Information Protocol

This chart includes a representative selection of vendors in the routers market. These vendors offer other routers, and other vendors not included may offer a full range of competitive products.

SOURCE: MIER COMMUNICATIONS, INC., PRINCETON JUNCTION, N.J.

Cooking up a net management solution

Integrated network management systems bring speed and flexibility to users monitoring multivendor networks.

In the realm of network management, where the shortcomings of IBM's NetView and AT&T's Unified Network Management Architecture (UNMA) have been discussed at great length, there is a new breed of products that offer certain advantages of speed and flexibility — for a price.

Like NetView and UNMA, the new systems are management-linking products. They can combine alarms from, and issue commands to, a panoply of devices.

A typical network may well involve leased-line and dial-up modems, multiplexers, private branch exchanges and packet switches — and even central office and tandem switches, for that matter.

Currently, two products fulfill this criterion. They are Allink Operations Coordinator, offered by Nynex Allink Co. of White Plains, N.Y.; and NetExpert ToolKit, offered by Objective Systems Integrators, Inc. of Folsom, Calif. These products provide fault and performance management as well as trouble ticketing for multivendor networks.

Each of the two packages can manage any vendor's equipment that has enough intelligence to evaluate its own level of performance. For example, some intelligent network equipment can identify the symptoms of poor network performance, diagnose its cause, pass that information to some upstream device and then respond to commands from the upstream device.

Most of today's networking devices have this type of intelligence. However, the challenge has always been to make devices speak the same language.

The architecture of network management systems is by now well known. Because human operators can't monitor thousands of devices individually, systems were created to do the job. Manufacturers sought to bring management capabilities to their devices, working upward from element management systems to enterprise management systems.

Element management systems (EMS) are proprietary application software systems offered by manufacturers of network elements, or components. They are designed to support multiple network devices from the same manufacturer.

EMSs filter alarms, alerts and informational messages from

(continued on page 82)

Horak is executive vice-president and Goleniewski is president of The Lido Organization, Inc., a Mill Valley, Calif.-based independent consulting and training firm specializing in network management.

By RAY HORAK and LILLIAN GOLENIEWSKI

ILLUSTRATION ©1991 CAROL O'MALIA

(continued from page 81)

network components, translate the information and present it to the network control center (NCC) operator in an understandable form. Based on that information, the NCC operator may issue commands to the components (from a list of menu options) directing them to reset themselves, turn themselves off or initiate further diagnostic tests.

EMS, one step above mess

Since EMSs and the network devices they monitor are from the same manufacturer, they usually speak the same language — which differs from the language spoken by another manufacturer's EMS and network equipment. These language differences make it difficult to integrate different vendors' EMSs. Each EMS has different attributes and a different set of capabilities to respond to different commands — each, of course, in its own language and syntax.

Furthermore, at its central management processor, each EMS presents information in a different screen format using different colors, menus and command options.

Remember the main

A step above EMSs are main, or domain, management systems (MMS). These systems are designed to manage a class of devices from a single terminal. However, an MMS can only manage devices from the same manufacturer. For instance, an MMS may manage a set of computers, front-end processors, controllers, terminals, modems and multiplexers, all manufactured by the same company.

Finally, at the highest level are enterprise management systems. These systems can manage all components that comprise a network, regardless of their manufacturer. At this level, all network devices can be managed from a single terminal, using a single software system that accepts, translates, filters, correlates, prioritizes and presents all information from these devices in a common format.

NetView, UNMA, Digital Equipment Corp.'s Enterprise Management Architecture (EMA) and Hewlett-Packard Co.'s OpenView are all enterprise management systems. But each falls short of delivering truly integrated network management.

These products have been much criticized for not delivering on their promise of true network management. Some enterprise management systems, such as NetView, are clearly oriented toward data management; others, such as UNMA, are oriented toward voice. Some systems, such as NetView, are considered by many users to be far from user friendly. And some enterprise management systems, such as EMA and OpenView, are still largely conceptual structures for future capabilities.

What is most onerous about these four highly publicized enterprise management systems is that each one forces the user into a manufacturer's proprietary view of networks. For example, NetView is useless without a Systems Network Architecture

TelWatch drops out of the market

The market for net management software is immature and developing more slowly than anticipated. As a result, many developers of such software systems are feeling the pinch.

In fact, Boulder, Colo.-based TelWatch, Inc., generally recognized as the originator of "roll your own" integrated network management systems, closed its doors in April. TelWatch was founded in 1986 and released its NetExec product in 1987. But despite millions of dollars of venture capital and support from Ameritech, TelWatch actually sold and installed very few systems. As of March 1991, two NetExec systems had been installed, two were in the process of installation, and another 10 had yet to reach the installation phase.

Whether the problems with NetExec involved design and packaging (lack of modularity), marketing (concentration on the end-user market), general focus (marketing and sales, rather than research and development) or a combination thereof, TelWatch's demise has clearly created considerable concern and confusion in the marketplace.

TelWatch's experience can be seen as part of a natural process of industry shakeout, according to Gary Tjaden, executive director of Nynex Allink Co., which makes an integrated net management system called the Allink Operations Coordinator.

"[Those firms with] a realistic vision will succeed, assuming that they possess the proper level of resources, wherewithal and sense of commitment," Tjaden says.

Tjaden attributes the slow development of the integrated network management system market to a sluggish economy, which has delayed many buying decisons, rather than to a lack of market interest. As a result, he says, "Nynex Allink sales are on target, and our research and development continues at budgeted levels."

— *Ray Horak and Lillian Goleniewski*

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NETWORK WORLD

Integrated Network Management Systems

Company	Product	Functional characteristics	Performance monitoring	Work order/ trouble ticket	Performance measurements	Reconfiguration/ restoration	Configuration management	Asset management	Host computers/ operating systems	Point of interface	System interfaces	Number of systems installed	Costs
Nynex Allink Co. **White Plains, N.Y.** **(914) 644-7704**	Allink Operations Coordinator (1)	Alarm filtering, thresholding, correlation and prioritization; user-definable escalation (number of occurrences)	Yes, if element supports it	Work order in future release; user-definable trouble ticket	Information can be collected and exported to other applications (such as calculation of mean time between failures, mean time to repair)	Automatic or manual run command or two-way interface	No, future application of Allink Network Management Solution product	Limited	Sun Microsystems, Inc. SPARCstation and SPARCserver running Unix	EMS	On demand (2)	3 fully installed; 4 in process of installation	$200,000 minimum configuration of hardware, software, training and customization; installation and training: included in first cost, additional at $1,000 per day; turnkey installation: standard; maintenance and support: 15% of current base software list price, 20% of subnetwork Interface list price; hardware, annual customization (policies and costs): fixed quote — all installations customized
Objective Systems Integrators, Inc. **Folsom, Calif.** **(916) 987-0310**	NetExpert ToolKit (3)	Alarm filtering, thresholding, correlation and prioritization; user-definable escalation (number of occurrences)	Yes, if element supports it	No work order — export to applications software; assigns trouble ticket	Bar charts, LED light state display, meter readings, bivariate analysis charts, statistical tables (such as calculation of mean time between failures, mean time to repair)	Automatic or manual run command or two-way interface (menu selection)	Yes, total network and element detail	Limited	Sun SPARCstation and SPARCserver running Unix; Digital Equipment Corp. DECstation 3100 running Ultrix	Either element or EMS	General release: IBM NetView; AT&T Unified Network Management Architecture; Network Equipment Technologies, Inc. IDNX; Northern Telecom, Inc. SL-1 Meridian; Wiltron Co. DEXCS; in development: Sun NetManager; DEC DECmcc; Pacific Bell LMOS (4)	31 fully installed; 26 in process of installation	Developer's copy: $72,000, plus $40,000 to $70,000 for third-party software developer's copy; run-time license fee negotiated on modular basis; installation and training: installation responsibility of OEM/end user, training $15,000 per week for OEMs, $10,000 flat fee for end users; turnkey installation: responsibility of OEMs and distributors; maintenance and support: 20% of software license fee, includes updates and support; customization (policies and costs): quoted as fixed price

EMS = Element management system
IDNX = Integrated Digital Network Exchange
LMOS = Line management operating system

FOOTNOTE:
(1) Distributed via direct sales.
(2) Nynex Integrated Network Management is responsible for interface development and maintenance.
(3) Distributed primarily via OEM; some direct sales to large users.
(4) OEM and end user are primarily responsible for interface development and maintenance.

This chart includes a representative selection of integrated network management systems. These vendors may offer other integrated network management systems, and other vendors not included may offer a full range of products.

SOURCE: THE LIDO ORGANIZATION, MILL VALLEY, CALIF.

network. EMA requires some DEC products. UNMA is hardly likely to be of value in a network that uses exclusively MCI Communications Corp. or US Sprint Communications Co. circuits. And OpenView is still too much of a question mark to be categorized.

All of these Big Four offerings have substantial and operational costs associated with them. For example, all four require additional hardware, software and memory, and place an added load on the CPU, which increases the cost for computer runtime.

An alternative

There is, however, an alternative to the big vendors' enterprise management systems. Tools exist that allow users to select which vendors' products they want to manage and to devise their own way of managing the network elements using dedicated workstations. These tools can be used even when the manufacturer of the modem, multiplexer or other device has not developed an interface from its product to UNMA, NetView or NetView PC. They have their own interfaces to NetView for those users who want to connect them to the SNA world.

These new products are called Integrated Network Management Systems (INMS). Like NetView and UNMA, they operate at the enterprise level.

But they also offer much more than the Big Four's enterprise management systems. The general characteristics of such systems include the use of integrated workstations, common language interfaces, rules-based logic and graphical mapping.

All alarms, alerts and informational messages are translated from the native language and syntax of the various network elements, MMSs and EMSs into a common English language format. In turn, all commands generated by the INMS are converted into native language and syntax.

Rules-based logic permits the user to threshold, or establish a set of rules or definitions that consider the frequency as well as nature of alarms or alerts. Based on such thresholds, the INMS will reclassify a low-level alert as a critical alarm if the frequency exceeds the threshold.

Graphical mapping enables the NCC operator to view both the physical and logical relationships among network elements. Such a view of the network facilitates the rapid identification and physical/logical location of network failures in the context of the total network.

INMSs are also unique in their architecture. The computing platform INMSs currently use is the Sun Microsystems, Inc. SPARCserver, based on a client/server architecture. This is in contrast to earlier EMSs, which use hierarchical architectures.

All INMSs currently use Ingres Corp.'s Ingres, a relational data base management system that permits the definition of relationships between objects. Ingres allows data bases of network components and relationships to be managed in a dynamic fashion. As the configuration and characteristics of a network change, the INMS can adapt.

Distributed processing capability is inherent in a client/server architecture, such as that of the SPARCserver. Not only can each server support multiple terminals and functions, but they can also be networked.

In a very large INMS application, individual software modules — each associated with a particular function — can be distributed among multiple servers, thereby enhancing the performance of the system as a whole.

In this manner, large, complex, geographically dispersed networks, which involve large numbers of disparate components and which serve geographically dispersed NCC operators, can be managed relatively easily.

Applications and functions

In its pursuit of a network management standard, the International Standards Organization (ISO) has defined a standard suite of net management applications. This suite includes fault, performance, configuration, security and accounting management. INMSs perform all these functions as well as another category — administrative management.

Fault management is the detection, isolation and correction of distinctly abnormal operations, called hard failures. It includes the monitoring, control and diagnostic capabilities needed to identify alarm conditions in the network. INMSs are designed to receive, filter, correlate and threshold such alarms from multiple devices and EMSs and, thereby, isolate and diagnose the specific point of failure.

Performance management is defined as the evaluation of the behavior of the managed objects. This function monitors and analyzes network traffic to gather performance trends and assess alternate configurations in order to improve overall net performance. In this manner, soft or performance-related network failures can be identified and isolated.

Configuration management details network status information and controls network routing functions. It provides the capability to define, add, remove or rearrange lines, paths, ports, devices and access levels on a dynamic, yet orderly, basis using detailed data bases that describe the network's composition.

Security management involves authentication, access control and data encryption techniques. It provides security over access to the network and to net management information.

Accounting management provides methods of determining and detailing the levels of network access and usage. Through this approach, networks and their access to applications can be optimized and users can be billed properly.

Administrative management oversees the costs, resources and processes that are critical to network operation and planning. In the voice world, telecommunications management software systems perform these functions, which the ISO has not yet defined ("Telemanagment tools keep nets under control," *NW*, July 2, 1990).

Included in this set of functions are call accounting, cost allocation, traffic engineering, network design and optimization, directory management, inventory and asset management, cable and wire management, work order and service order management, problem (trouble ticket) management, and contract/vendor management.

At some level, INMSs address many of these functions. Interfaces with telemanagement software systems are not yet avail-

(continued on page 85)

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(continued from page 83)

able to support the applications. But while no such announcements have been made, the interfaces are expected to be developed and announced soon.

The issue of multivendor connectivity is truly the key to effective integrated network management. It is highly unlikely that any two networks will be either configured or managed in the same way. Even a network of moderate size will involve many intelligent network components of disparate function and origin.

Integrated network management systems such as NetView, NetView PC and UNMA depend on relationships between manufacturers. Relying on these intervendor arrangements has proven to be a problem in many cases. Often users select vendors that simply choose not to work together. Thus, relying upon these arrangements would limit the flexibility of the user to implement and manage a network configured to unique requirements and preferences.

Roll your own

INMSs rely on the user to establish the links between different vendors' management products. This can be called a "roll your own" approach.

INMSs free the user from the constraints of vendor relationships by allowing linking programs to be reverse engineered. In other words, INMSs can break the codes of other management systems, and they are thus capable of understanding dialogues between the various network elements and EMSs.

In this manner, the alarms, alerts and informational messages emanating from the devices, as well as the commands issued by the EMSs, are captured and analyzed. Once this information is incorporated into the INMS, the system can interpret for the NCC operators.

The expert system tool kits that accomplish this function have been refined to the point that highly reliable interfaces can be developed in a matter of days. Vendors such as Objective Systems Integrators offer tool kits for end users and OEMs. Such an approach also places the responsibility for interface development and maintenance squarely on the shoulders of the user or OEM.

The approach used by Nynex Allink, on the other hand, reserves Nynex Allink the right to develop the interfaces to the various EMSs. Nynex Allink also is responsible for ensuring the continuing integrity of that interface.

There are, admittedly, several obvious disadvantages to this "roll your own" approach.

First, it takes an appreciable amount of skill and time to identify and analyze a complete dialogue between the network elements and the EMSs. While the base process of dialogue monitoring may take only a few days, the process of setting the rules for managing the dialogue may take several weeks. Even then, one cannot be absolutely certain that every alarm, alert, informational message and command has been identified, classified and understood.

Second, every new network element and associated generic software release, enhancement, bug fix or workaround must be analyzed in order to ensure the continuing integrity of the INMS.

Third, experienced NCC operators will often realize increased speed and functionality in a cut-through mode, working with the EMS in native mode.

Network management is not an inexpensive proposition. This fact is reflected in the cost of these three products as detailed in the chart on page 83. Yet the total costs of these systems compare favorably to the cost of those developed and offered by the Big Four.

Additionally the "roll your own" approach provides the client company with capability to tailor the integrated network management system to the specifics of the subject network. In other words, the client is not constrained by either standards or existing relationships between network management vendors and manufacturers of network components.

Therefore, the client company has a great deal of flexibility to configure the network according to its own unique requirements and to manage that entire network and all the associated subnets from a single workstation.

A desire for freedom from vendor constraints motivated Vanguard Cellular Systems, Inc. of Greensboro, N.C. to implement the NetExpert ToolKit in August 1990. Mike Dodson, manager of Vanguard's network operations center, says the company was seeking network management flexibility so that it wouldn't have to depend on a vendor for system modifications and updates. Dodson says both the financial investment and the investment in time and effort have yielded substantial benefits for Vanguard.

While most manufacturers will seek full Open Systems Interconnection compliance, others, such as IBM, are likely to be less enthusiastic. They have too much invested in proprietary net management tools and, therefore, a vested interest in continuing to promote a relatively closed environment. In any event, it will likely be mid-decade before OSI net management standards are fully developed and implemented.

If and when standards relieve the difficulty of managing heterogeneous networks, such systems will still offer such a high level of independent functionality that their value will remain apparent. In the meantime, "roll your own" INMSs enable users to effectively manage critical and disparate nets on a dynamic basis.

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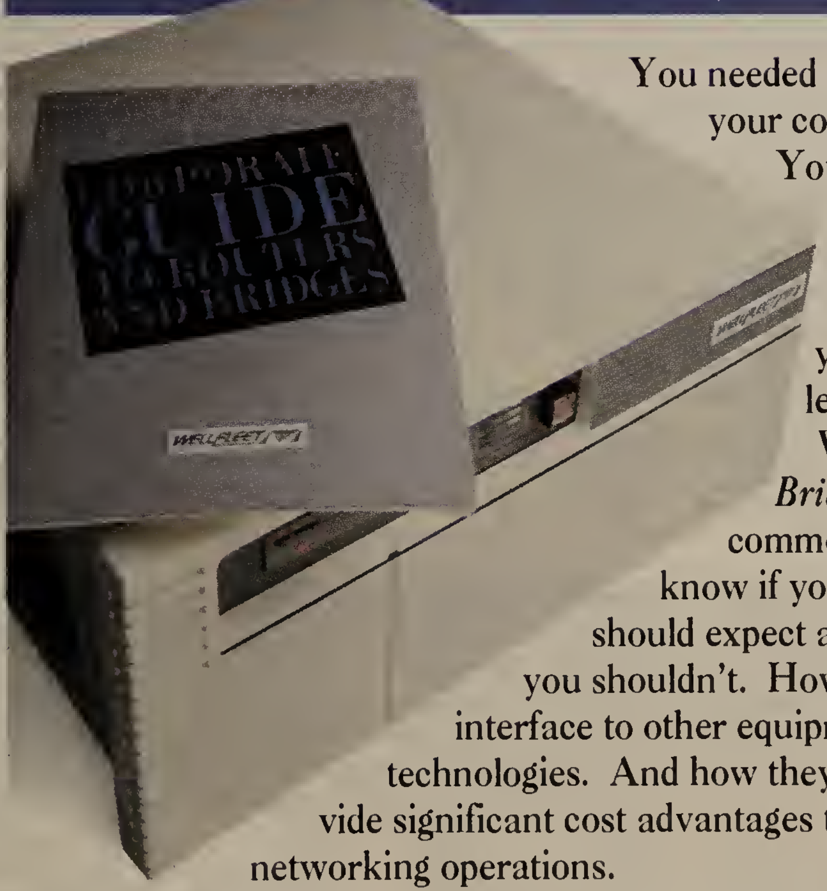

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Routers and combination bridge/routers (continued from page 80)

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/ features	Protocols supported	Performance/capacity	Management	Price
3Com	BR/2000 Local Ethernet Bridge/Router	Local; 2 Ethernet LAN ports	Ethernet: AUI or thin-wire interfaces	NA	Motorola 68020 CPU; desktop or rack-mountable	Concurrent bridging and routing for linking local Ethernet LANs	IP, IPX, XNS, OSI, DECnet (all routed or bridged); net control: RIP, ICMP, ARP, OSPF, IS-IS, DECnet, Spanning Tree Protocol	Routing throughput: 6.4K packet/sec (LAN-to-LAN, single protocol); bridge forwarding: 10K packet/sec	Vendor's network control server; Telnet control access; SNMP	$5,495 (configuration not specified)
	BR/3000 Wide Area Ethernet Bridge/Router	Local/remote; 2 Ethernet LAN ports, 2 WAN ports	Ethernet: AUI or thin-wire interfaces	RS-232, RS-449, V.35, fractional T-1, T-1/E-1, frame relay; WAN link speeds to 4M bit/sec	Motorola 68020 CPU; desktop or rack-mountable	Concurrent bridging and routing for linking multiple local and remote Ethernet LANs	IP, IPX, XNS, OSI, DECnet (all routed or bridged); X.25 and PPP; net control: RIP, ICMP, ARP, OSPF, IS-IS, DECnet, Spanning Tree Protocol	Routing throughput: 6.4K packet/sec (single LAN, single WAN, single protocol); bridge forwarding: 10K packet/sec	Vendor's network control server; Telnet control access; SNMP	$5,995 (configuration not specified); $450 option for X.25 and frame relay support
The Software Group, Ltd. **Woodbridge, Ontario** **(416) 857-0238**	NetcomRouter (software-only product)	Local/remote; software supports X.25 WAN ports; number of LAN ports depends on hardware platform	LAN interfaces vary and depend on Unix platform configuration	Software supports WAN ports to 64K bit/sec	Software router; runs on Unix 386 system; LAN/WAN interfaces (not included) are AT- or MicroChannel-bus cards	IP router software for Unix 386 system; supports LAN and WAN connections	IP only; X.25 over WAN links; IP to X.25 address mapping, per DDN; net control: standard TCP/IP	Routing throughput: software can utilize a 64K bit/sec X.25 link at 95%; routing table is static, size limited to storage capacity of system	Standard TCP/IP management supported	$600; also requires vendor's X.25 software; other related software products available
Timeplex, Inc. **Woodcliff Lakes, N.J.** **(201) 391-1111**	TIME/LAN 100 Router*Bridge	Local/remote; up to 12 ports (any combination of LAN and WAN)	Ethernet: AUI; token ring: DB9 connector (4M and 16M bit/sec); FDDI: DAS via MICs	RS-232, RS-433/449, V.35, T-1, E-1 (G.703); T-1/E-1 is framed	Intel 80386 CPUs (33 and 25 MHz); desktop or rack-mountable	Concurrent routing and bridging for linking local and remote Ethernet, token-ring and FDDI LANs	IP, IPX, XNS, (DECnet, OSI planned); X.25 (HDLC, LAP B used for WAN links); PPP; net control: RIP, ARP, ICMP, OSPF, Source Routing, SRT	Routing throughput: 25K packet/sec (1 Ethernet, 1 E-1 WAN port, 64-byte IP); bridge forwarding: 14K packet/sec (Ethernet, 64-byte); filtering at maximum LAN speeds for all LAN types	FDDI Station Management Version 6.2; vendor's SNMP-based TIME/LAN 100 Element Management System; SNMP	$7,995 (2 Ethernet ports) to $26,695 (2 Ethernet, 1 token ring, 1 FDDI); $10,000 vendor's SNMP management system
Tri-Data Systems, Inc. **Santa Clara, Calif.** **(408) 727-3270**	MaxWay 500	Local; up to 6 LAN ports (Ethernet, token ring and LocalTalk)	Ethernet: AUI and thin-wire interface; token ring: DB9 connectors (4M/16M bit/sec); LocalTalk: Mini-8 connector	NA	Sun SPARC CPU; VMEbus architecture; desktop or rack-mountable	Multiprotocol router for linking different LAN types in a mixed Apple/IBM/ Novell environment	IP, IPX, AppleTalk; net control: TCP/IP and AppleTalk protocols	Routing throughput: not specified, but slow speed of AppleTalk will impose limits for large number of users	Terminal port for local management; integral proprietary interface to software (included) that runs on any network node	$5,495 (Ethernet or token ring, TCP/IP or AppleTalk) to $6,495 (Ethernet and token ring or IPX)
Unisync, Inc. **Upland, Calif.** **(714) 985-5088**	Unilinc Communications Server	Local/remote; up to 10 ports (2 LAN, 8 WAN); dependent on PC platform used	Up to 2 LAN ports supported per server platform (PC); most supported (such as NETBIOS and NetWare)	RS-232, RS-422, V.35, X.21, T-1/E-1 (requires external; DSU); vendor offers WAN boards supporting various interfaces; maximum WAN data rate 2.048M bit/sec	Interface cards plug into AT- or MicroChannel-bus PC; 8 ports/4 boards maximum; routing software runs on PC under DOS or Unix	Multiprotocol routing software runs on DOS- or Unix-based PC; works with vendor-supplied adapter cards for WAN communications	IP, IPX, NETBIOS (static routing); X.25 or SNA/SDLC over WAN links; numerous terminal protocols also supported over WAN links	Routing throughput: up to 60% utilization on each WAN link (data compression also available); routing-table capacity: 1,024 routes	Vendor's Unisync Remote Network Services (PC-based software and adapter card, runs on any network node)	$2,700 to $6,000, depending on options
Ungermann-Bass, Inc. **Santa Clara, Calif.** **(408) 987-6509**	ASM 8300 Series	Remote; Ethernet or token-ring LAN connects via backplane of vendor's Access/One hub; router module supports 1 or 2 WAN ports	LAN connections via other media/interface modules; Ethernet: AUI; token ring: DB9 connector (4M/16M bit/sec)	RS-232, RS-422/449, V.35, X.21, frame relay (optional), T-1/E-1 (channelized by external CSU/DSU); WAN link speed to 2.048M bit/sec supported on all WAN links	Routers are modules that plug into vendor's Access/One hub enclosure; system supports up to 10 router modules	Multiprotocol bridge/router module for hub enclosure; links remote Ethernet or token-ring LANs	IP, IPX, XNS, DECnet, AppleTalk; optional X.25 (HDLC/LAP B over WAN links); net control: RIP, OSPF, Spanning Tree Protocol, Source Routing, as appropriate	Routing throughput: 5K packet/sec (single LAN, single WAN, IP routing); bridge filtering at LAN media rates; forwarding: 6K packet/sec (64-byte); address routing table: to 16,000 entries	SNMP	$4,995 (1 Ethernet, 1 WAN port) to $7,495 (2 WAN ports); $9,995 multiprotocol bridge/router software ($1,490 with X.25 support)
Wellfleet Communications, Inc. **Bedford, Mass.** **(617) 275-2400**	Feeder Node	Local/remote; up to 2 LAN and 2 WAN ports	Ethernet: AUI, thin-wire or 10BaseT interfaces; token ring: 4M or 16M bit/sec via DB9 connector; FDDI; SAS or DAS via MICs	RS-232, V.35, X.21, fractional T-1, frame relay, SMDS, T-1/E-1, (single or multiple DS0s represent a single channel)	Motorola 68030 CPUs; VMEbus architecture; desktop, wall- or rack-mountable	Multiprotocol, concurrent bridging and routing between different LAN types over WAN links	IP, IPX, XNS, DECnet, AppleTalk; X.25; HDLC, SDLC, PPP; net control: RIP, OSPF, Spanning Tree Protocol, SRT	Routing throughput: 14.5K packet/sec; bridge filtering/forwarding: 14.5K/14.5K packet/sec	Vendor's SNMP-based network management system (Sun-based); SNMP	$6,495 (configuration not specified); $15,000 vendor's SNMP management system
	Link Node	Local/remote; up to 8 LAN and 16 WAN ports	Ethernet: AUI, thin-wire or 10BaseT interfaces; token ring: 4M or 16M bit/sec via DB9 connector; FDDI; SAS or DAS via MICs	RS-232, V.35, X.21, fractional T-1, frame relay, SMDS, T-1/E-1, (single or multiple DS0s represent a single channel)	Motorola 68030 CPUs; VMEbus architecture; desktop, wall- or rack-mountable	Multiprotocol, concurrent bridging and routing between different LAN types, LAN-to-LAN or over WAN links	IP, IPX, XNS, DECnet, AppleTalk; X.25; HDLC, SDLC, PPP; net control: RIP, OSPF, Spanning Tree Protocol, SRT	Routing throughput: 14.5K packet/sec (single LAN and single WAN); bridge filtering/forwarding: 14.5K/14.5K packet/sec	Vendor's SNMP-based network management system (Sun-based); SNMP	$11,000 (configuration not specified); $15,000 vendor's SNMP management system

ARP = Address Resolution Protocol
AUI = Attachment unit interface
BRI = Basic Rate Interface
CMIP = Common Management Information Protocol
CSU = Channel service unit
DACS = Digital access and cross-connect system
DAS = Dual-attached station
DDN = Defense Data Network
DSU = Data service unit
EGP = Extended Gateway Protocol
EIA = Electronic Industries Association
ES-IS = End System to Intermediate System
ICMP = Internet Control Message Protocol
IGRP = Internet Gateway Resolution Protocol
IPX = Internetwork Packet Exchange
IS-IS = Intermediate System to Intermediate System
LAP B = Link Access Procedure B
LAT = Local Area Transport
MIC = Media interface connector
MMAC = Multi Media Access Center
NA = Not applicable
OSPF = Open Shortest Path First
PPP = Point-to-Point Protocol
PRI = Primary Rate Interface
RF = Radio frequency
RIP = Routing Information Protocol
RISC = Reduced Instruction Set Computer
RTMP = Routing Table Maintenance Protocol
SAS = Single-attached station
SMB = Microsoft's Server Message Block
SMDS = Switched Multimegabit Data Service
SNMP = Simple Network Management Protocol
SRT = Source routing transparent
VLSI = Very large-scale integration
ZIP = Zone Information Protocol

This chart includes a representative selection of vendors in the routers market. These vendors offer other routers, and other vendors not included may offer a full range of competitive products.

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Routers and combination bridge/routers

Vendor	Product	Local/remote support	LAN support	WAN support	Processor/ configuration	Operation/ features	Protocols supported	Performance/capacity	Management	Price
Wellfleet	Concentrator Node	Local/remote; up to 26 LAN and 52 WAN ports	Ethernet: AUI, thin-wire or 10BaseT interfaces; token ring: 4M or 16M bit/sec via DB9 connector; FDDI; SAS or DAS via MICs	RS-232, V.35, X.21, fractional T-1, frame relay, SMDS, T-1/E-1, (single or multiple DS0s represent a single channel)	Motorola 68030 CPUs; VMEbus architecture; desktop, wall- or rack-mountable	Multiprotocol, concurrent bridging and routing between different LAN types, LAN-to-LAN or over WAN links	IP, IPX, XNS, DECnet, AppleTalk; X.25; HDLC, SDLC, PPP; net control: RIP, OSPF, Spanning Tree Protocol, SRT	Routing throughput: 14.5K packet/sec (single LAN and single WAN); bridge filtering/forwarding: 14.5K/14.5K packet/sec	Vendor's SNMP-based network management system (Sun-based); SNMP	$20,000 (configuration not specified); $15,000 vendor's SNMP management system
Xyplex **Boxborough, Mass.** **(508) 264-9930**	MX6020 Remote Bridge/Router	Remote; 1 Ethernet LAN and 2 WAN ports	Ethernet: AUI	RS-232, RS-423, V.35, T-1/E-1; to 2.048M bit/sec on WAN ports	CPU not specified; stand-alone	Concurrent bridging and routing between remote Ethernets over 1 or 2 WAN links	Routed protocols not specified; net control: Spanning Tree Protocol	Routing throughput: 1,200 packet/sec (64-byte); bridge filtering/forwarding: 14.88K/1,200 packet/sec; address routing table: 2,000 addresses (standard), 8,000 (special order)	Local console port; Telnet remote access; SNMP	$4,495
	MX6510 Remote Bridge/Router	Remote; 1 Ethernet LAN and 2 WAN ports; connections can be established via LANBUS backplane of vendor's concentrator	Ethernet: AUI	RS-232, RS-423, V.35, T-1/E-1; to 2.048M bit/sec on WAN ports	Card module that plugs into vendor's MAXserver 4000 or 5000 series LANBUS communications chassis	Plug-in module provides concurrent bridging and routing between remote Ethernets over 1 or 2 WAN links	Routed protocols not specified; net control: Spanning Tree Protocol	Routing throughput: 1,800 packet/sec (64-byte); bridge filtering/forwarding: 14.88K/1,800 packet/sec; address routing table: 2,000 addresses (standard), 8,000 (special order)	Local console port; Telnet remote access; SNMP	$3,495 (plug-in router module only; all hub/server components, chassis and such extra)

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SOURCE: MIER COMMUNICATIONS, INC., PRINCETON JUNCTION, N.J.

Datacom Buyer's Guide

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Network Management Protocol (SNMP).

An astonishing 60% of bridges and 75% of routers listed can now be managed by a central-site network management system via SNMP. In most cases the SNMP agent is included as an integral part of the bridge's or router's operating software.

However, some vendors charge extra for SNMP management support (typically $1,000 to $1,500). A few vendors stated that SNMP was planned or under development, but that it was not currently available.

SNMP has clearly become the management protocol of choice, at least for bridges and routers. Testing of routers' SNMP capabilities was recently completed as part of the *Network World*/AT&T Bell Labs SNMP Test Series, the results of which will appear in an upcoming article. The test results show subtle differences and glitches in the individual SNMP implementations of the vendors tested. However, SNMP unquestionably enabled a mix of routers to be effectively managed by different generic SNMP management systems.

Most of the token-ring-oriented bridges and routers listed in the tables do not yet offer SNMP management support. Most of them do provide an inherent reporting mechanism compatible with IBM's LAN Manager. In a few cases, support for Digital Equipment Corp.'s management system, DECmcc, or DECnet router management protocols was indicated.

In the remaining cases, network management is still the exclusive province of the vendor's proprietary network management system.

The last column in both the bridge and router tables contains the list price for the product. For self-contained, fixed-configuration devices, such as a desktop local bridge with two Ethernet AUI ports, a single list price (as opposed to the normal price range) is supplied. This usually reflects the cost of a complete unit, though in some cases options may cost extra, such as SNMP management.

> SNMP has clearly become the management protocol of choice.
>
> ▲▲▲

A large number of the bridge and router products are of a multislot chassis design, and a range of pricing is given to reflect typical low-end and high-end configurations.

Bridges still tend to be less expensive than routers when both support the same LAN-interface configuration. But the price differential is narrowing. And routers or brouters now generally cost only about 30% to 50% more than the price of a device that only does bridging.

Calculating costs

Users need to keep some cost concerns in mind. For example, a remote bridge or router supporting a single LAN port and a WAN port may cost slightly more than a local device with two LAN ports, but remote units need to be deployed in pairs.

Also, a number of products in the charts reflect the incremental price for bridge and router modules that plug into the vendor's multislot concentrator or hub chassis, such as ChipCom, David Systems, Inc. and SynOptics Communications, Inc.

These are generally usable only with that vendor's concentrator system because of the module's dimensions, but also because they employ the usually proprietary backplane/bus interface and data rate of that particular concentrator sysetm.

In these cases, users need to consider the whole cost of the concentrator system, along with any other plug-in interface modules that may be required.

In general, the wide range of available bridge and router products reflects a buyer's market. What's more, users can expect more and more enhancements — such as increased throughput — even while prices continue spiraling downward. ◘

Letters

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The telecommunications industry does not need more federal or state regulation. Instead, the industry should support organizations such as Building Industry Consulting Service International, the National Association of Radio and Television Engineers and the Society of Technical Consultants in establishing standards and recognized certifications. We'll then be able to police our own.

Licensing will affect consultants and nonconsultants alike. If you value your livelihood, take action now. Write your legislators — both state and federal — and let them know your position. Join an organization and support industrywide standards and certifications.

Larry LaBorde
President
Telecommunications Resource
Associates
Houston

Your Pro/Con article on consultant licensing "Should communications consultants be licensed?" covered an important issue. Consultants and users alike must clearly understand that all forms of licensing done at the state level have only one purpose — to protect the local worker from out-of-state competition.

Think about the impact on the medical practice in Florida and Arizona if retired doctors decided to keep a hand in the field with a few patients.

Neither oaths nor credentials are substitutes for competence. Similarly, exams in casually related fields (such as electrical engineering relative to telecommunications) are also suspect.

It would be a mistake to assume that because professional engineers have an engineering degree and have passed an exam heavily slanted toward building contractors in one of the many states in which their clients' systems operate, they are automatically qualified to be experts in voice or data communications.

College education emphasizes theory, which is easy to teach and relieves the instructor of any responsibility for keeping up with current practice. Among other things, college avoids almost completely the application and use of communications systems and the economics required to make productive selections. State boards build their exams with strong input from professors.

The user does, indeed, deserve some sort of protection. There are too many people, engineers and nonengineers alike, using the term "consultant" as a more acceptable synonym for "unemployed" or "retired."

But *if* licensing is to be the answer, it should be done at the national level. Any certified capability that becomes invalid at an arbitrary political boundary is clearly not designed to serve the interests of users.

Lee Goeller
Professional engineer
Haddonfield, N.J.

(continued on page 108)

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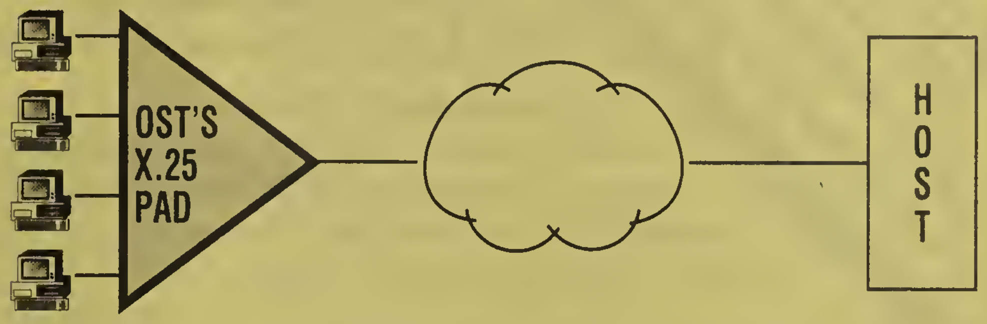

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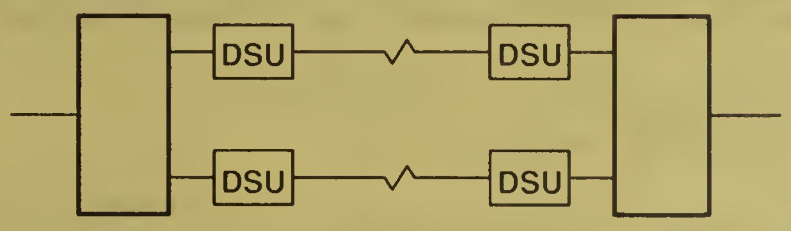

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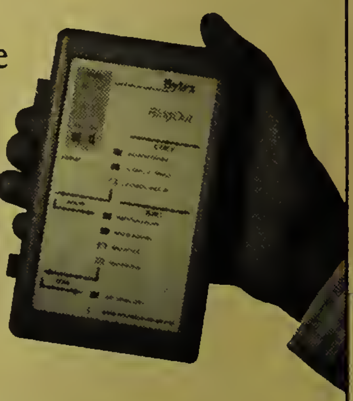

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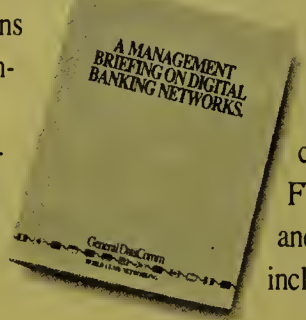

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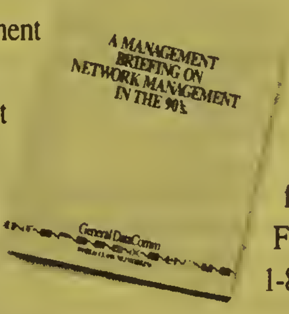

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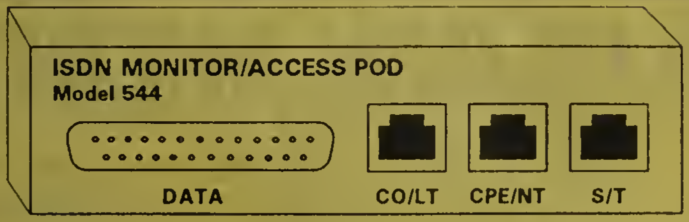

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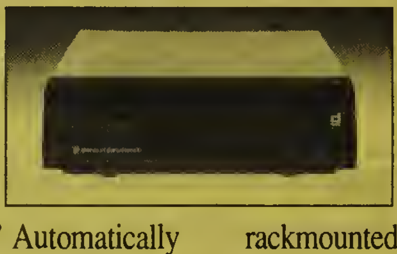

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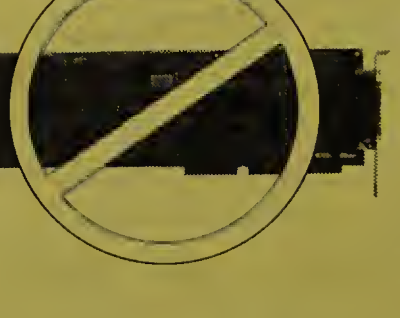

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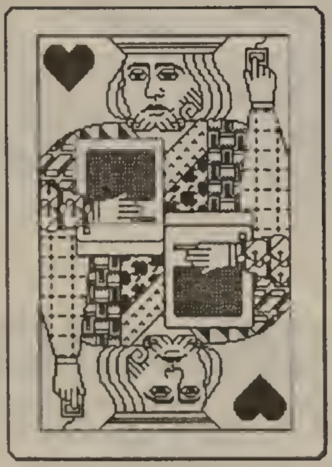

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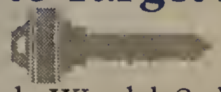

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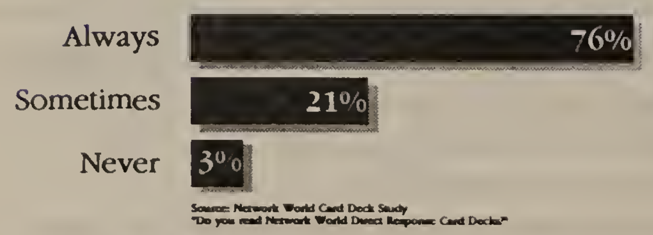

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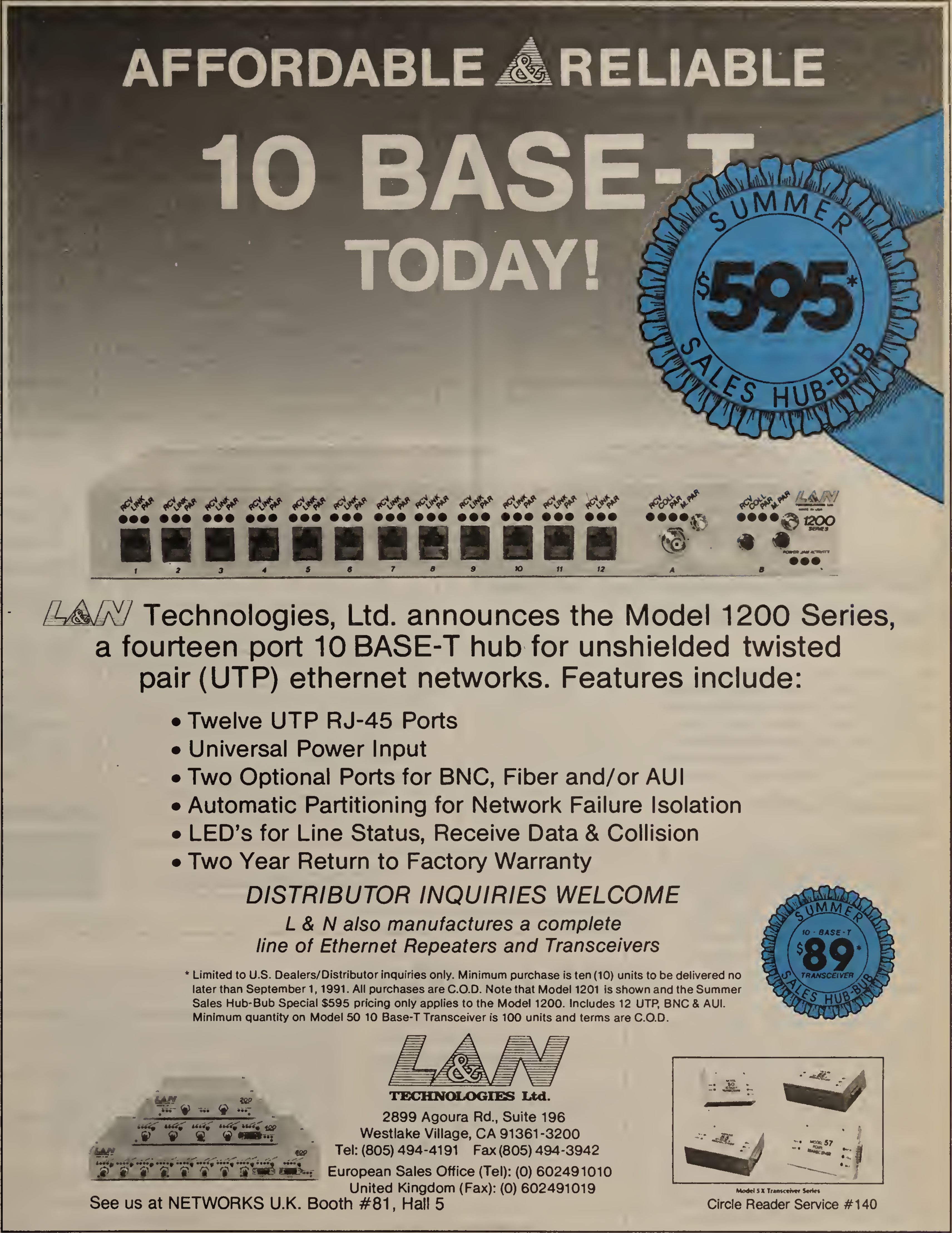
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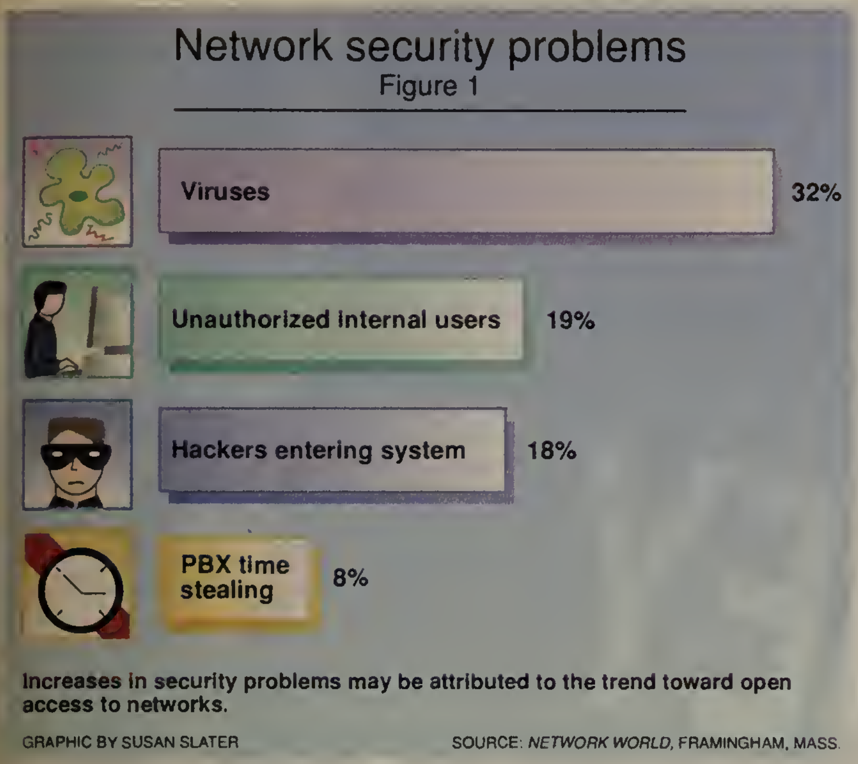

Network security problems
Figure 1

Increases in security problems may be attributed to the trend toward open access to networks.

GRAPHIC BY SUSAN SLATER SOURCE: *NETWORK WORLD*, FRAMINGHAM, MASS.

(continued from page 46)

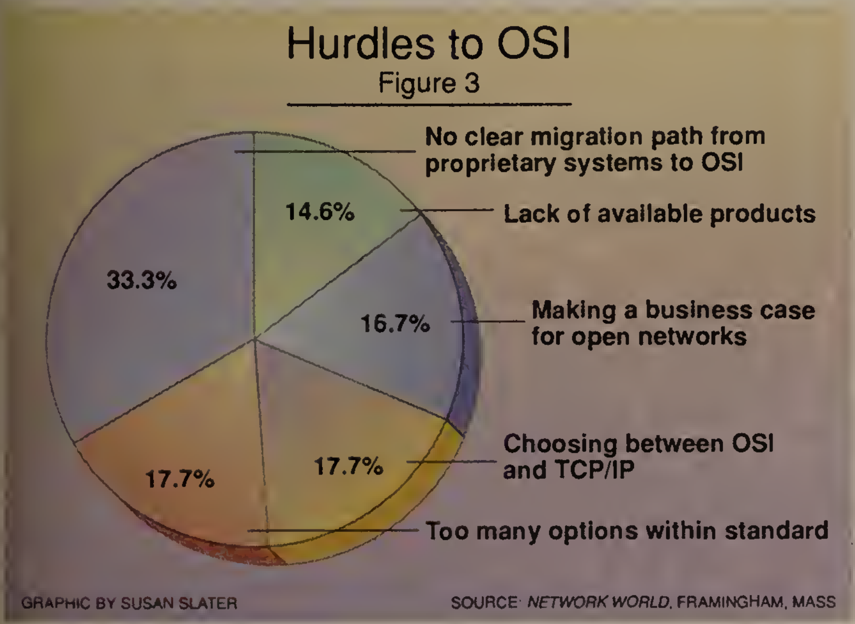
resources and expertise.

Cost was another reason cited for outsourcing (see graphic, page 1). For example, 38% of the respondents who outsource cited cost effectiveness as their reason for doing so. And 20% of those who do not outsource said it's cheaper to do the work themselves.

While the survey found that relatively few net managers are turning to outsourcing today (the 12% who did so for data communications was the highest percentage by sector), 38% of those surveyed said they will consider outsourcing in the future.

No sweat or threat

Because so many net managers are considering outsourcing, respondents were asked whether they feel outsourcing represents a threat to the network manager's stature in their company. The response was a resounding "No!" Eighty-seven percent of the managers surveyed said they do not see outsourcing as a threat.


Hurdles to OSI
Figure 3

GRAPHIC BY SUSAN SLATER SOURCE: *NETWORK WORLD*, FRAMINGHAM, MASS

Outsourcing aside, net managers are starting to use, or have plans to use, new technologies to provide the network services that users are demanding. Leading the field of hot technologies are client/server computing and distributed data bases. The survey found that 29% of the respondents have used these technologies for more than a year.

Furthermore, an additional 17% of respondents said they have recently implemented distributed data bases, while 10% have recently implemented client/server computing. More than 30% of survey respondents said they are planning to implement both technologies.

Simple Network Management Protocol (SNMP) was the next hottest technology. Fifteen percent of respondents said they have used SNMP for more than a year. Another 10% have recently implemented SNMP, while another 17% plan to implement SNMP.

Networks based on the Fiber Distributed Data Interface standard were the next technology on net managers' lists. Thirteen percent of those surveyed said they have used FDDI for more than a year. Another 5% have recently implemented FDDI networks, and 24% plan to do so.

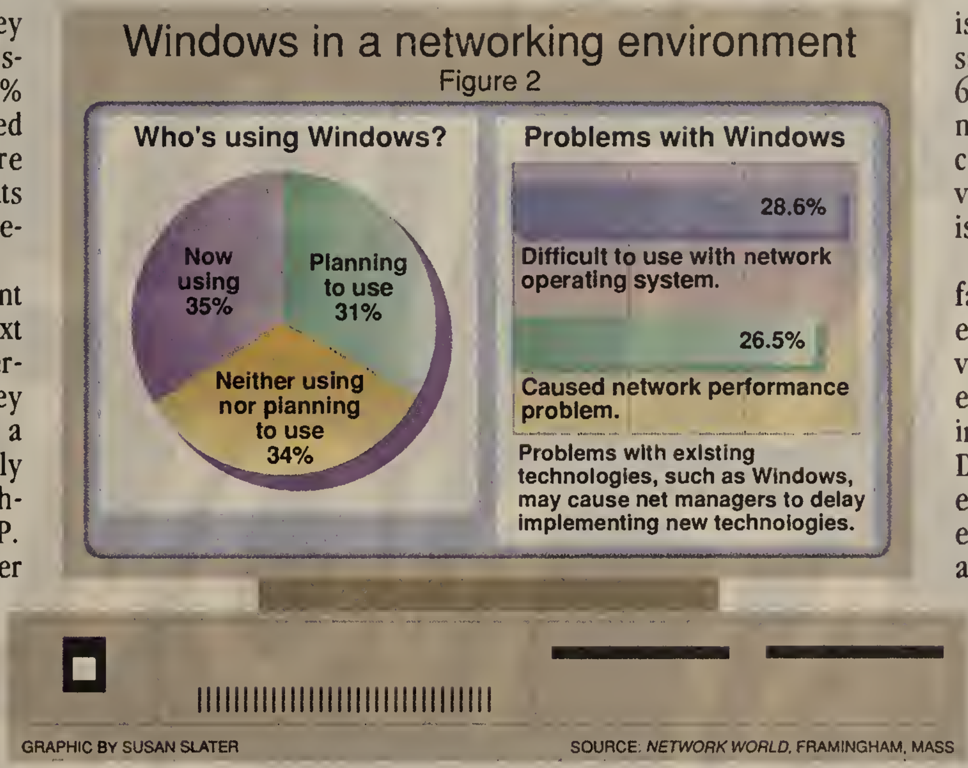
Some technologies are so new that they did not score high with network managers. For example, no survey respondents had used networks with Synchronous Optical Network (SONET) technology. And only 2% said they have recently implemented SONET in their company, while 5% said they plan to implement it.

Similarly, frame relay's newness showed up in the survey. While 2% said they have recently implemented frame relay, another 9% plan to implement the technology.

Conversely, the survey revealed that some technologies, which one would expect to be used extensively, quite surprisingly had low numbers of users.

For example, only 9% of net managers surveyed said they have used electronic data interchange for more than one year. Four percent have recently started using EDI, and 30% plan to use EDI in the future. Still, a full 57% said they have no plans to use EDI in their companies.

Imaging networks also turned in surprisingly low numbers. Only 7% of respondents said they have used imaging nets for more than one year; another 7% have recently implemented image networking. A third of the respondents said they plan to use imaging networks, yet 53% have no such plans.


Windows in a networking environment
Figure 2

Problems with existing technologies, such as Windows, may cause net managers to delay implementing new technologies.

GRAPHIC BY SUSAN SLATER SOURCE: *NETWORK WORLD*, FRAMINGHAM, MASS

Managers' reluctance

Network managers may be hesitant to implement new technologies because of problems they are experiencing with existing technologies.

For example, 35% of survey respondents said they are currently using Microsoft Corp.'s Windows 3.0 in a networking environment (see Figure 2, this page). Among those respondents, 26.5% said Windows has caused a network performance problem, and 28.6% had difficulty getting Windows to work with their network operating systems.

Fifty percent of network managers said they use or plan to use Open Systems Interconnection-based networks. Yet survey respondents perceive many obstacles to OSI nets (see Figure 3, this page). For instance, a third of the respondents said there is no clear migration path from proprietary systems to OSI. About 18% of the survey respondents said there are too many options within the OSI standards, and another 18% are concerned about making a choice between OSI and Transmission Control Protocol/Internet Protocol for their networks.

Moving mission-critical applications from mainframes to LANs, or downsizing, is done by 46% of survey respondents. Thirty-seven percent said downsizing saves them money, and 39% said it provides better user response times.

Yet, 26% of respondents said integrating LANs and wide-area networks is a major concern to them. Another 16% said the proliferation of equipment in a LAN environment is hard to manage; while 14% are most concerned about the problems of communicating between different kinds of LANs.

Whatever the technology, network managers must deal with vendors or service providers. And survey respondents indicated that overall they have a modest level of satisfaction with these groups.

For example, 51% of those surveyed said the service representatives they deal with are knowledgeable and helpful. And 56% get timely service from their vendors.

Satisfaction levels with local exchange carriers were incredibly high. Eighty-three percent of survey respondents said they would not switch from their local exchange carrier if given the opportunity. Overall, the survey reveals that 14% of the net managers are very satisfied with their local exchange carrier's services, while another 74% are satisfied. Only 2% of the respondents said they are very dissatisfied.

A closer look

Those numbers are for the entire survey sample. However, differences in satisfaction level show up when the results are further analyzed. For instance, among the 32% of the net managers that use alternative local carriers, 23% said they are very satisfied and 68% said they are satisfied. However, for the nearly 65% of the respondents who do not use alternative local exchange carriers, only 10% are very satisfied, while 76% are satisfied.

While the overall level of satisfaction with local exchange carriers was high, 22% of those surveyed said they think local exchange carriers have been slow in deploying Integrated Services Digital Network services. Another 33% said the initial ISDN equipment and service offerings are too expensive.

Thirty-nine percent of the survey respondents said the local Bell operating companies do not provide the advanced services — ISDN and Switched Multimegabit Data Service, for example — that they need. And 39% said the Bells are moving too slowly in improving their networks.

This lack of satisfaction with

(continued on page 107)

An industry cross section

The results of this management survey are based on 100 phone interviews conducted for *Network World* during the week of April 15 by First Marketing Research, a national marketing research firm in Austin, Texas.

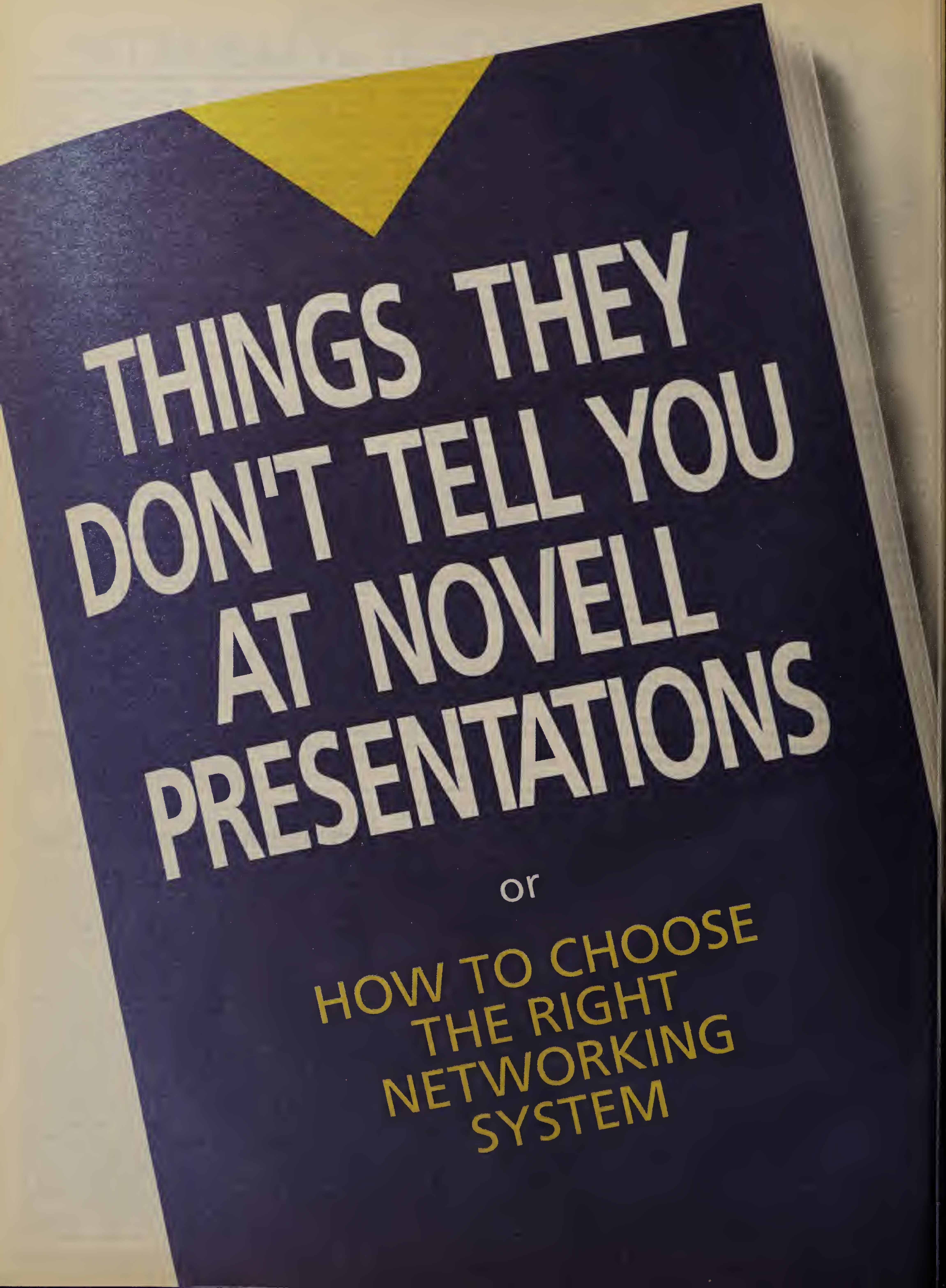
The respondents' responsibilities cover the entire range of network management. Thirty-eight percent of the respondents described their primary job function as management of both voice and data networks. Twenty-nine percent are mainly responsible for data communications management, 75% for telecommunications management and 26% for MIS management. All of the respondents listed managing their company's communications network as their primary day-to-day responsibility.

Thirty-five percent of the managers surveyed are responsible for an enterprisewide network, while 15% handle multiple organizations. Another 16% are managing divisional networks, and 32% manage departmental networks.

Respondents from all over

Respondents to the survey represent a cross section of vertical industries. Nineteen percent of the managers surveyed work for manufacturing companies. Another 13% of the respondents work for companies whose primary business is finance, insurance or real estate; 13% work for utilities, transportation or communications companies; 12% work for the government; 11% are in educational institutions; 9% are consultants; and 5% work for retail or wholesale companies.

— *Salvatore Salamone*



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SNA nets

- 56% of net managers using SNA backbones want to support other protocols such as TCP/IP or OSI on their networks.

(continued from page 103)

service offerings from the local exchange carriers could become more pronounced in the future as 31% of the net managers surveyed said they do not currently use ISDN but are planning to use it.

When asked about dealings with long-haul carriers, 48% of the respondents said they use more than one. Two-thirds said they try to leverage one carrier against another to get better prices and service. Other than attaining the best price or service, 43% of the respondents said they use more than one long-distance carrier for backup capabilities. Thirty-seven percent said that using more than one long-distance carrier provides more efficient or faster alternate routing of their calls.

Downsizing

- 46% of survey respondents say they are running on LANs mission-critical applications that they used to run on mainframes or minicomputers.
- Cost-effectiveness and better response time are the primary reasons for downsizing.

The survey results paint a picture of an industry with some problems but also many positive aspects. Staffing levels are more up than down, and new technologies are being integrated into existing networks — albeit with some difficulties.

It's harder to find staff with networking skills such as network management and data communications. And the lack of in-house technical expertise is the main reason net managers outsource.

The survey also found that net managers are getting the service and technical support they need from vendors in a timely manner. Similarly, the local exchange carriers are providing net managers with the services they require.

Staffing levels

- 42% of survey respondents say they increased networking staff last year. Nearly a third of those reporting increases added 1 staff member, and another 25% added 2.
- 12% decreased networking staff; of those, 36% dropped 1 position.

Unisys pack creates mainframe quartet

continued from page 39

Protocol connectivity can be employed to let non-Unisys systems tap into the Gladiator complex.

Besides the 2200 Series mainframes, the main components of Gladiator are the General Purpose Transaction System (GPTS) and the Unisys Record Lock Processor (RLP).

The GPTS includes the enhanced Unisys OS1100 multihost operating system and 40 to 150 additional software packages that come preconfigured to work together. Unisys claims that the software can be installed and running in a few hours.

The RLP is an existing Unisys product that channel-attaches to mainframes and handles requests for files that can be accessed via multiple mainframes. When a request arrives, the RLP determines if the file is in use. If not, it gives the requester access to the file and prevents others from accessing it until the first user's transaction is complete.

> The GPTS includes the enhanced Unisys OS1100 multihost operating system and 40 to 150 additional software packages that come preconfigured to work together.
>
> ▲▲▲

Thomas Murphy, director of the technical support department at the Naval Computer and Telecommunications Station in Newport, R.I., said that during the Desert Shield operation, his systems had to operate around the clock to support retail, banking and other operations.

"This kind of system would've helped us a lot," said Murphy, who is also president of USE, Inc., a Unisys user group. "As good as we did, we could've done better."

Gladiator for Unisys 2200/400 hosts will be delivered in the fourth quarter. It ranges in price from $2.95 million to $11.09 million, including the mainframe and RLP. The system for 2200/600ES mainframes will ship in the second quarter of 1992 and will range in price from $9.58 million to $50.71 million. Pricing has not yet been finalized for the software components alone.

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Letters

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Licensing focus

In response to your April 15 Pro/Con titled "Should communications consultants be licensed?" I believe that in the future, some states may require that communications consultants be licensed. However, the professional engineer licensing process is the last place to look for a model licensing program.

The training required for a professional engineer appears to have little, if any, relevance to communications consulting. At best, I could see where it would be helpful to have access to a licensed engineer when running cable. A licensed engineer could do such things as certify that the cable installed conforms to local ordinances.

However, running cable is a minor part of a communications consultant's job. Much more important are the issues of connectivity and performance. Every day, these issues are becoming more and more a software problem. Most licensed engineers have little training in software.

It is significant that *some* states now have questions about electrical engineering on the professional engineering tests. This has not always been the case.

For example, the 1990 national engineer-in-training test, which is taken as a prelude to the professional engineer test, had only 24 questions on electrical circuits, out of a total of 210 questions, which is only slightly more than the 21 questions it had on economics. The remainder of the test primarily concerned the traditional engineering disciplines.

In addition, the 500-page study book for the engineer-in-training test had 25 pages on computers: six pages on computer hardware, nine pages on FORTRAN, six pages on data structures and languages, and four pages on analog computers — yes, analog computers.

The problem with requiring professional engineer certification is that most of the people certified will only be trained in such essential skills as taking soil samples and figuring stress in concrete. The people most qualified through experience in the industry and formal training would not be certified since they rarely have an engineering degree.

Bruce Hayden
Vice-president
A/B Network Systems, Inc.
Golden, Colo.

Your debate on the merits of licensing for communications consultants ("Should communications consultants be licensed?" *NW,* April 15) was interesting.

The Board of Directors of Building Industry Consulting Service International (BICSI) is firmly in favor of licensing individuals who design low-voltage systems (whether voice or data). We do not, however, feel that the professional engineer should be the arbitrary standard by which we gauge the skills of those in low-voltage design.

BICSI has long recognized that the general public needs help selecting consultants to design their low-voltage systems. In response to this need, BICSI developed the Register Communication Distribution Designer (RCDD) program to test and register low-voltage distribution designers. BICSI documents that applicants have been involved in the design field for a minimum of two years.

Qualified applicants then sit for a comprehensive four-hour exam that focuses entirely on the design of low-voltage systems. Applicants who pass the exam are then registered with BICSI as RCDDs. Like professional engineers, RCDDs also have a code of conduct to which they are expected to adhere. Approximately 600 RCDDs are active in the U.S and Canada.

The consumer has the right to be protected from charlatans and incompetents in the industry. We maintain that licensing standards such as the RCDD program are a relevant and logical answer to this concern.

Larry Romig
Executive director
Building Industry Consulting
Service International
Tampa, Fla.

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NETWORK WORLD PREFERRED OVER COMMUNICATIONS WEEK BY NEARLY 2 TO 1

NETWORK WORLD
The Newsweekly of User Networking Strategies
Volume 7, Number 23
An International Data Group Publication
June 4, 1990

Unisys set to unveil X.500 plans, tools

Unisys X.500 Directory Services

When is diverse network routing not really diverse?

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DEC offers document mgmt. for DECnet

Plan would let users better manage compound documents consisting of text, images, graphics.

USER ADVISORY PANEL

NW's User Panel speaks out on ISDN

NETLINE

FEATURE

Top ISDN switches lack mutual compatibility

Network World was voted the 'most useful' networking newsweekly by members of the prestigious International Communications Association (ICA) in the most recent Networking/Communications Market Survey conducted for *Networking Management* magazine by Research U.S.A.

Q. *Which of the industry newspapers that you read regularly is most useful to you in designing, operating and managing your network?*

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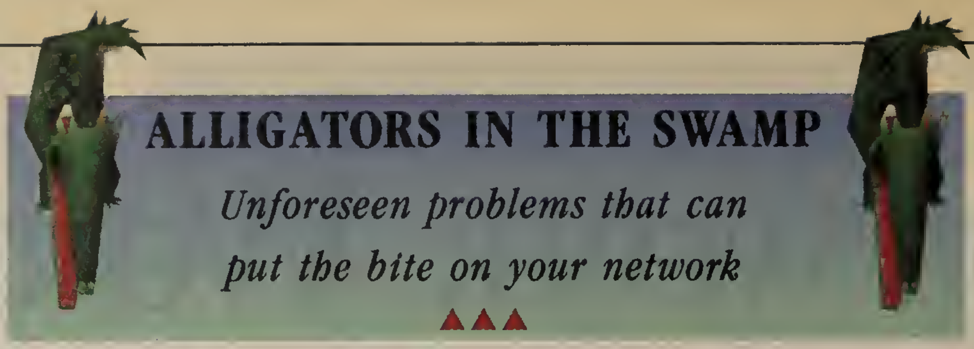
ALLIGATORS IN THE SWAMP

Unforeseen problems that can put the bite on your network

When modems can't communicate

MNP incompatibilities muddled Baxter Healthcare's modem operations.

In networking, as in human relationships, compatibility is essential. As I recently found out, achieving compatibility between modems that use different implementations of the Microcom Network Protocol (MNP) can be as difficult as getting a feuding couple to sit down and work out their differences.

MNP is an error-correcting protocol designed to provide additional protection for asynchronous data. The protocol has four classes of error correction (1 to 4), plus an additional class (5) that provides data compression and can effectively double the data throughput. (Since the episode related here occurred, other layers of MNP have been introduced, as has the V.42bis data compression standard.)

My MNP encounter occurred in April 1990, when I assumed responsibility for coordinating Baxter Healthcare Corp.'s dial-up data communications requirements. My first project was to install the communications equipment necessary to support two new personal computer-based systems: one for providing the sales force with enhanced customer and product information, and another for tracking and ticketing field service calls.

Our field service personnel were using Compaq Computer Corp. 286 SLT laptops with internal Quay Computer Corp. Datastar 2,400 bit/sec modems.

Our sales reps were on two systems. Some were using GRiD Systems Corp. Model 1550sx Roadrunner laptops equipped with internal 2,400 bit/sec Option 532 U.S. Robotics, Inc. modems. Others were using Compaq 386 LTE laptops equipped with docking ports, internal Quay 2,400 bit/sec laptop modems and external Racal-Milgo 9632VP 9.6K bit/sec modems. The primary transfer rate desired was 9.6K bit/sec, but we equipped the LTEs with internal modems so that the reps could download their data while traveling.

At the host end, we had Racal-Milgo 3220 V.32 9.6K bit/sec and 4492E V.22 2,400 bit/sec rack-mountable modems. All host and off-site modems used the MNP 5 data compression protocol.

Both host-site modem pools connected to a US Sprint Communications Co. TP4252 packet switch (TP4), which Baxter owns. The TP4 was connected via X.25 links to an IBM 3725 front-end processor running under IBM's Network Packet Switching Interface. This configuration supported Baxter Peer-to-Peer Communications, our application-to-application software, which allowed the laptops and the host running CICS applications to communicate.

Because of this motley assortment of communications equipment, our network used several different variations of MNP. The hardware (modem-to-modem) versions could negotiate MNP 5 sessions, but each modem vendor used a slightly different flavor of that class. The software (personal computer-to-modem) versions were only capable of MNP 4 sessions and could not be used at speeds greater than 2,400 bit/sec. We also had to contend with different bit/sec rates for the different application and modem types.

To make matters even more complicated, we discovered that US Sprint's public data network (PDN), which we were using for alternative access for our main WATS modem pool, would support only MNP 3 on its 2,400 bit/sec modem pools.

Due to all these variables, several problems arose:

- When using the software version of MNP, the V.32 modems would not complete the negotiation handshake.
- Software MNP used on the PDN would occasionally result in the loss of a transmitted character, which would cause the application programs on the laptops to abort.
- Whenever a Quay modem would call into either the Racal 3220 or 4492E pool, our script program would freeze up when it exited the application briefly to issue a set command to the TP4 to modify the forwarding character.
- The 9.6K bit/sec links would overdrive the buffers on the laptops.
- For no apparent reason, the GRiD modems would appear to stop receiving in the middle of a transmission.

Since these problems were so diverse, MNP incompatibility wasn't the obvious cause. Even when we began to suspect it might be, we found it next to impossible to monitor modem-to-modem MNP, because MNP only appears on the analog side of the modem and is not usually accessible by a data scope.

We examined the laptops' buffer sizes and how they operate, and then dug into exactly how MNP negotiates a session. Finally, with the help of several vendors, we determined the root of most of the problems:

- The V.32 modems were not returning a second acknowledgment that software MNP requires to complete the handshake. Racal upgraded the 4492E modems to handle MNP 5 and upgraded the 3220 modems to the next model (3264, a dual-modem card that has V.32 and V.42bis on it).
- The script freezing problem was the result of an incompatibility between the MNP implementations of the internal Quay modems and the Racal host-based modems. Upgrading the central-site modems solved this problem.
- To control our buffer overruns, we implemented passthrough flow control on the remote and host modems, let the application keep track of buffers and data rates and left MNP to tend to error conditions, as it is supposed to.
- With the help of Jerry Keeran of GRiD Systems in Fremont, Calif., we discovered that the GRiD internal modems were submitting an MNP block retransmission request to the host-site Racal 3220s when a line hit was detected, but that the 3220 would ignore this command and continue transmitting data until the end of the block. The Racal 3264 modems addressed this problem but wouldn't allow us to use a data scope. We eventually determined that specifying a constant data interface rate of 9.6K bit/sec would enable us to view the data.

We never did figure out why we lost characters on the PDN with software MNP, and decided not to deploy the software MNP option in the network. Our applications allowed us to dictate the type of modem used at the personal computer end and, therefore, would always have hardware MNP available.

MNP advice

MNP, in and of itself, is a great protocol. But don't count on MNP from vendor X to automatically be compatible with MNP from vendor Y.

First, check with the vendor to ensure that the modems you are interested in actually comply with MNP and CCITT standards, and are not just compatible.

Second, test the application thoroughly before rollout. By this I mean test it yourself, have the development team test it next, and then try a small diverse group of actual users. Call the users frequently to get updates.

Another useful idea is to develop some kind of communications log that duplicates what is happening on the laptop's digital interface and writes all on-line transactions to a file for later review. Such a log would allow you to monitor even those pesky internal modem models. This can be invaluable, especially if your application doesn't allow you to view what is happening on the line.

Fortunately, most MNP differences are not irreconcilable. With a little counseling and creativity, they can usually be ironed out. ◻

Tindall is project leader of information resources for Baxter Healthcare Corp. in McGaw Park, Ill.

IT'S HARD TO DRAIN THE SWAMP when those reptiles keep getting in the way. To share your "alligator story," call Susan Collins, associate features editor, at (508) 820-7413 or fax your idea to (508) 820-3467.

By STEVEN TINDALL

VA IS chief stumps for applications

continued from page 4

country. The VA also provides mortgages, insurance and other benefits to veterans.

The agency operates four data processing centers nationwide and uses the Integrated Data Communications Utility, a value-added private packet network provided by SAIC, Inc., for its data communications needs.

Although Woods praised the VA's packet network, he noted that EDI-based applications and network links to other agencies would vastly improve service to veterans. For instance, Woods said the VA needs to establish a link to the Department of Defense to encourage data sharing. Currently, the Defense Department ships veterans' files to the VA, which then must rekey the data into its own system.

"The VA has only one customer: the veteran," Woods said. "After [the Defense Department] is finished with him, we've got him until he dies." The Defense Department should send its veterans' files to the VA electronically so it can reduce the time needed to establish benefits eligibility, he added.

Woods also emphasized the need for EDI-based applications within the VA. He said he'd like to see the VA hospitals and pharmaceutical warehouses use EDI to smooth out the order cycle and keep inventories stocked.

According to Woods, the VA stores $40 million worth of pharmaceuticals in its warehouses and is forced to monitor storage facilities. If the VA implemented EDI, paperwork could be eliminated and prescription orders could be filled more quickly, he said. With just-in-time inventory systems, the warehousing requirement could be greatly diminished or even eliminated. The VA is now testing use of EDI and imaging, another promising application for the medical environment, he added.

Woods would also like to see the VA adopt a centralized data base system in order to better coordinate the sharing of veterans' files, which are now scattered across various sites.

If the VA can't improve service delivery, Woods said, it could face extinction. "If our quality of service is not up to snuff and the private sector provides better service delivery, how long will it be before someone says, 'Why do we need a public health care provider?' " he said.

Despite identifying ways in which the applications of network technology could improve service to veterans, Woods said his greatest remaining obstacle is convincing top management to make the changes.

"A large part of upper management at the VA doesn't think it has a problem," Woods said. "It's unfortunate we have to effect change from below, but sometimes you have to shake up the bureaucracy a little."

Newbridge preps mux, control tools

continued from page 4

4602 MainStreet Intelligent NetworkStation.

Jim Michaels, vice-president of network planning at Newbridge, said the 5638 supports all standard SNMP Management Information Base (MIB) variables, which describe attributes of managed objects. The product comes with MIB Walker, a facility that lets users read or write any MIB object to an SNMP node.

With the graphical user interface of the Sun Microsystems, Inc. SPARCstation-based 4602, users can employ icons to graphically represent SNMP nodes, such as gateways, routers, bridges and LAN adapter cards. Alarms are detected using SNMP traps and user-set polling priorities.

Remote devices must be configured by accessing their native network management systems via Telnet, which is the Transmission Control Protocol/Internet Protocol virtual terminal protocol, or VT-100 terminal emulation.

SNMP LAN Manager

Newbridge will also this week announce the 8001 MainStreet LAN Manager, a personal computer-based LAN network management system with SNMP support. The product supports most of the same features as the 5638 but does not have a graphical interface. The 8001 runs under DOS on an IBM Personal Computer AT or compatible with a 20M-byte hard disk drive.

Michaels said another new feature in the 4602 software will improve the rerouting process in Newbridge T-1 networks by organizing calls so that those with similar priority levels and destinations are logically grouped together. If a T-1 link or node should fail, a group of calls can be rerouted as one instead of rerouting each separately according to its priority level.

In addition, Newbridge will unveil Off Node Resources, a new facility that extends Newbridge voice compression features to nodes not currently outfitted with support for those features, Michaels said.

For example, a call may be set up to use adaptive differential pulse code modulation (ADPCM) from a node where ADPCM is not available. The call will be rerouted to the nearest node where ADPCM is available, and the compression technique will then be employed.

The 3606 is available now and ranges in price from $2,750 to $3,500. Pricing and availability dates for the other new products could not be obtained by press time.

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Senate to vote on Hollings' RBHC bill

continued from page 4

concentrate on adding amendments to the bill to beef up consumer safeguards. Last week, Sen. Larry Pressler (R-S.D.) introduced three amendments to Hollings' bill that would help guard against possible RBHC abuses.

One amendment would increase from $6,000 to $10,000 the fines an RBHC would have to pay for violating Federal Communications Commission accounting rules. A second amendment would give state regulators greater authority to cooperate with one another and to set up financial record systems to catch RBHC manufacturing abuses.

A third amendment prohibits the RBHCs from purchasing equipment exclusively from their own manufacturing operation. Pressler said if the RBHCs refuse to buy equipment from any vendor other than themselves, competing equipment firms could be driven out of business.

Other hurdles loom ahead

Even if Hollings' bill clears the Senate, it must still win approval in the House of Representatives, where support is much weaker and more discussion and amendents will certainly loom. The White House has also expressed concern about any legislation containing domestic manufacturing provisions because such language is viewed as protectionist.

Two other bills dealing with various aspects of lifting the ban on manufacturing are pending in the House. These legislations — one from Rep. Michael Oxley (R-Ohio) and one from Rep. John Bryant (D-Texas) — include provisions on consumer safeguards and domestic manufacturing that appear to conflict with the Hollings bill.

However, Rep. Edward Markey (D-Mass.), chairman of the House Subcommittee on Telecommunications and Finance, has not yet moved on the issue.

In April, he circulated a draft of bill similar to Hollings' that would lift the Modified Final Judgment ban, but he has not introduced the measure officially. ◘

MICOM boosts features of X.25 packet switches

By Paul Desmond
Senior Editor

ANAHEIM, Calif. — MICOM Communications Corp. this week will announce new software that will enable its X.25 packet switches to support voice and facsimile traffic and give the devices enhanced security features.

MICOM's new Featurepak software package, which will be unveiled at the International Communications Association's 44th Annual Conference and Exposition here, supports a High-Level Data Link Control pass-through feature for the company's Model MB3 and MB300 Packet Switches. That feature will enable the switches to carry both voice and fax traffic over 56K bit/sec lines.

The voice and fax capability requires MICOM's MB2 statistical multiplexer, outfitted with a voice adapter card that supports the voice or fax channel, said Colin Martin, product manager for X.25 products at MICOM, based in Simi Valley, Calif.

The voice card digitizes analog voice channels and compresses them to 8K bit/sec. For analog fax traffic, the card digitizes the signal for transmission at either 4.8K or 9.6K bit/sec, depending on the capacity of the channel allocated to it.

Once the analog circuits are digitized by the adapter card, the MB2 then forms HDLC packets, each with 32 bytes of digitized voice or fax. These packets are fed to the MB3 or MB300 switch, which strips out the 32 bytes and attaches an X.25 header.

In that fashion, packetized voice or fax can be integrated with X.25 data packets for transmission over private wide-area links, which MICOM recommends be at least 56K bit/sec. Another MB2 voice card at the receiving end resynchronizes the voice or fax packets.

"We've run successful tests with two voice circuits and [28K bit/sec of] data running over a single 56K bit/sec line," Martin said.

Two new security features have also been added to the Featurepak. The first is support for a Network User Identification (NUI) number, which lets MICOM switches check internal incoming calls against a table of authorized users. NUIs can also be used to ensure that only authorized users make calls from MICOM switches to public data nets, Martin said.

MICOM will also support calling address validation, which lets the switch verify that calls coming from public data nets are from authorized users. The feature checks the origination address of a call against a table of authorized addresses.

Additionally, MICOM will announce that the number of X.25 links supported by the MB300 has increased from 12 to 18, of which as many as six can run at 72K bit/sec and the remainder at 19.2K bit/sec. As many as 255 concurrent calls are supported. The MB3 supports a maximum of 127 concurrent calls and as many as 12 X.25 links, with two at 72K bit/sec and the remainder at 19.2K bit/sec.

Pricing for the switches starts at $2,555 for a six-link configuration. The Featurepak software, which is available now, costs $595. ◘

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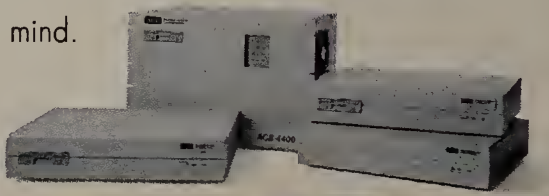

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IBM to add frame relay, E-net to FEP

continued from page 1

tying the 3745's new frame relay interface into a public frame relay service or the IDNX to support a private frame relay net. The 3745's Ethernet interface will give users another way to tie Ethernet LANs to IBM hosts and could enhance the front end's role as a multipurpose concentration device supporting Systems Network Architecture and other LAN traffic.

Officials at IBM and NET declined to confirm or deny the announcements.

However, sources familiar with IBM's plans said the 3745 frame relay interface will support T-1. It will be implemented via enhancements to the 3745's Network Control Program software and possibly a new hardware module.

Benefits of frame relay

A frame relay interface would provide better bandwidth utilization and improved performance for the 3745. Today, individual channels are dedicated to cluster controllers and other devices. Frame relay would allow those devices, either LAN-attached or hard-wired to the 3745, to contend for the full T-1 trunk bandwidth, said David Passmore, a partner with Network Strategies Practice, a network consulting practice of Ernst & Young in Vienna, Va.

"You could connect with frame relay and get the performance advantage of T-1 without having to allocate a full T-1 [to each device]," Passmore said.

Users can employ the frame relay interface through either of two basic options. The first is with a public frame relay service, such as the WilPak service available from WilTel. Sources said IBM is testing the 3745 frame relay interface with WilPak, which is supported by StrataCom, Inc. IPX T-1 multiplexers.

"As with a number of other vendors, we have had discussions with IBM for WilPak service, but beyond that we cannot comment," said Russ Ray, vice-president for engineering at WilTel.

The second option would be to connect the 3745 to a frame relay-capable T-1 multiplexer, such as the IPX or NET's IDNX with its new frame relay interface.

NET's new card will give the IDNX, which is currently based on a circuit-switched architecture, support for packet-mode services like LAN routing and frame relay. NET demonstrated the card at the Communication Networks '91 conference in Washington, D.C. in January but has yet to formally announce it ("Data Packets," *NW,* Feb. 11).

The Travelers, Inc., an insurance company in Hartford, Conn., has been testing the IDNX packet module for some time but declined to comment on its performance prior to the announcement. Trav Waltrip, vice-president of telecommunications for the company, said the new IDNX card "will be the router for our frame relay network."

Rick Malone, a principal with the consultancy Vertical Systems Group in Dedham, Mass., said the IDNX, unlike a standalone router, will be able to dynamically allocate bandwidth to the packet module as LAN traffic requires. Waltrip declined to say whether that feature is working yet.

Sources expect IBM's initial frame relay offering to support only SNA traffic between 3745s. At a later date, IBM is likely to announce frame relay support on its 3172 Interconnect Controller, which attaches LANs to host channels and links mainframe channels over T-1s.

The 3172 has also been one of the chief ways to attach an Ethernet LAN to an IBM host. Ethernet support on the 3745 will provide an additional option and will not require a dedicated mainframe channel.

IBM has also offered such products as the 8209 LAN Bridge, which can bridge an Ethernet LAN to a token-ring network, but the new feature will let users attach an Ethernet directly to a 3745.

Ethernet support fits with IBM's strategy to support Transmission Control Protocol/Internet Protocol and Open Systems Interconnection protocols, which often run on Ethernet-attached machines.

In addition, competitors such as NCR Corp.'s Network Products Division (the former NCR Comten) already have Ethernet support on their IBM-compatible front-end processors.

Although it could not be confirmed by press time, IBM may also announce support for T-3 and the 100M bit/sec Fiber Distributed Data Interface on the new 3745 models, or a statement of direction for those interfaces. ☐

Tridom router sends data via satellite

continued from page 6

er to announce plans for a LAN internetworking product, observers said. In fact, Fowler said several vendors made pitches to his company.

Hughes Network Systems has been developing LANAdvantage, a LAN interface for its VSATs, for the past 18 months, according to Carol Politi, marketing specialist for the Germantown, Md., VSAT maker. The bridge/router card, which will support Ethernets and token rings, will be available in the fourth quarter, she said.

LANAdvantage will likely support Systems Network Architecture, TCP/IP and other protocols, and will be used in several beta-test sites this summer, Politi said. While the company has not officially announced the product, word of it leaked out last fall and more details will be available later this year, she said. ☐

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Early users praise service

continued from page 2

and is currently available at 56K, 64K and 384K bit/sec. In the future, SDDN will support 1.544M bit/sec dial-up links.

NCR, the first SDDN beta site, began testing the service in August 1990. "Our SDDN pilot has met or exceeded all our original benchmarks and objectives in the areas of availability, reliability and performance," Russo said.

AT&T's SDDN at a glance

Introduced: May 1990

Speeds supported:
Currently: 56K, 64K and 384K bit/sec Planned: 1.544M bit/sec

Access methods:
Dataphone Digital Service or ISDN Primary Rate Interface

Availability: 444 points of presence

Top SDDN applications:

- Videoconferencing
- File transfer
- Private-line backup

Vendors whose equipment is certified by AT&T to work with SDDN:

Ascend Communications, Inc.	Promptus Communications, Inc.
General DataComm Industries, Inc.	Teleos Communications, Inc.
ISDN Technologies Corp.	Timeplex, Inc.

SDDN = Software-Defined Data Network

GRAPHIC BY SUSAN J. CHAMPENEY SOURCE: AT&T, BASKING RIDGE, N.J.

NCR used a 56K bit/sec SDDN link to connect the company's corporate headquarters in Dayton, Ohio, with its World Service Parts Center in Peachtree City, Ga. Employees in Dayton used workstations behind an AT&T Definity private branch exchange equipped with a PRI to access parts ordering and parts locater applications on an NCR host in Peachtree City.

"In the pilot, we tested an SDDN link to see how long it would stay up," Russo said. "It never went down."

Later in the test, NCR used a 384K bit/sec SDDN circuit to link token-ring networks at two sites in Dayton and later tried that same circuit to support a videoconference.

Both NCR sites were tied into AT&T's network using T-1 access links and General DataComm, Inc. (GDC) MegaMux T-1 multiplexers equipped with GDC's ISDN Aggregate Card, which supported SDDN's automatic restoration feature that reestablishes interrupted SDDN calls in about 20 seconds.

The multiplexers were used because the Definity PBX could not yet support switched 384K bit/sec channels, and neither could the LAN bridges used, which limited throughput to about 160K bit/sec. But even at that speed, 1M-byte files were transmitted in an average of 50 seconds.

"Users were quite pleased with the performance [and] couldn't tell the difference between accessing data on their local server and accessing it from the remote server," Russo said.

Overall, the SDDN circuits tested outperformed the AT&T guarantees, Russo said. AT&T promises that customers with the service will experience no more than 38 severely errored seconds per day. NCR averaged only three a day.

SDDN postdialing delays can last as long as six seconds during call setup, but NCR only encountered a three-second delay. And although the SDDN performance specification says users can expect 1% call blocking during peak hours, NCR didn't experience any blocking.

The company was pleased enough with the results of the trial to begin gradually replacing private lines used for disaster recovery and alternate routing with SDDN links.

NCR may eventually use the service to support its 12-site videoconferencing network.

"Today, we deploy videoconferencing using dual 56K bit/sec switched digital services until we can use the PBXs or multiplexers to support PRI," Russo said. "At some point, we'd like to skip the switched digital services step and deploy videoconferencing using SDDN."

Much of NCR's long-term data networking plans will be decided during the next 12 to 18 months. The company is trying to determine how and where to use SDDN.

"We're at the edge of needing additional bandwidth," Russo said. "The question is whether to move to multiple [56K or 64K bit/sec] channels or take advantage of the flexibility built into SDDN and get switched [384K bit/sec] on demand. We're hoping to see SDDN expanded and broadened to the European marketplace so we can provide SDDN on a global basis."

Another early user of SDDN is Liberty Mutual Insurance Co. After a successful beta test, the company began using 56K bit/sec SDDN circuits to back up portions of its nationwide T-1 backbone net. Ten branch offices already use SDDN, and another 14 sites will begin using it soon.

"SDDN lived up to — and in some cases, exceeded — its performance standards," said Arthur Greenfield, Liberty Mutual's communications consultant. "SDDN is as good as private lines, but I wouldn't say it's better."

Liberty Mutual's nationwide T-1 backbone supports an IBM Systems Network Architecture net and links 10M bit/sec Ethernets at division headquarters and branch sites, Greenfield said.

The insurance company uses 56K bit/sec digital data service (DDS) lines to back up T-1 links between its larger sites. However, Liberty Mutual found it was cheaper to use SDDN than 56K bit/sec links because the company could use its existing T-1 access trunks to support the SDDN links instead of the end-to-end DDS links.

Liberty Mutual pays an average of $630 per month for each DDS access line. Providing two DDS lines to a site would cost $1,260 in local access alone, while taking two SDDN channels would only cost about $100. "Those economics are quite compelling," Greenfield said.

The company is not overly concerned about how long employees at its sites use SDDN.

AT&T SDDN rates

On-network daytime rates for dial-up digital links

Mileage band	56K and 64K bit/sec		384K bit/sec	
	First 18 seconds	Each additional 6 seconds	First 18 seconds	Each additional 6 seconds
0 to 55	$0.1043	$0.0081	$0.6138	$0.0446
56 to 292	0.1157	0.0119	0.6759	0.0653
293 to 430	0.1265	0.0155	0.7356	0.0852
431 to 925	0.1334	0.0178	0.7731	0.0977
926 to 1,910	0.1334	0.0178	0.7731	0.0977
1,911 to 3,000	0.1355	0.0185	0.7851	0.1107
3,001 to 4,250	0.1466	0.0222	0.8463	0.1221
4,251 to 5,700	0.1466	0.0222	0.8463	0.1221

GRAPHIC BY SUSAN J. CHAMPENEY SOURCE: AT&T, BASKING RIDGE, N.J.

"We're using SDDN for backup, so usage isn't that important to us," Greenfield said. "We [want every office] to have data connectivity. So we'll do whatever we have to do to get an office back up."

Firm to install Hong Kong node

continued from page 6

lines used by foreign-owned IVANs to provide services to users.

These restrictions were dropped as part of a trade agreement with the U.S. government. Couche said BT North America will be the first foreign-owned IVAN with its own node in the country.

Mexican service

BT North America is also scheduled to announce, belatedly, that it greatly expanded its service to Mexico six months ago. The company extended its service by forging a link with Telefonia y Conmutacion Digital, a new Mexican VAN that is known as Grupo SIT.

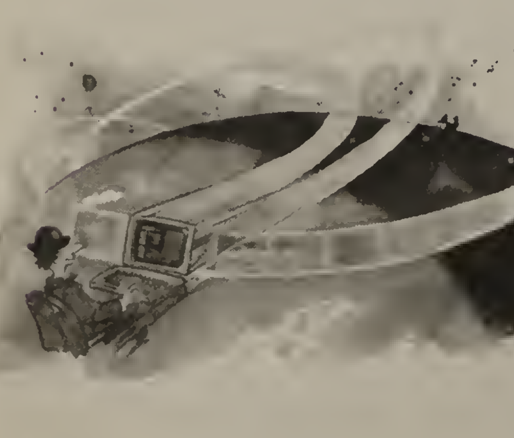
At about the time the service was expanded, Grupo SIT established a VAN with nodes in the Mexican cities of Guadalajara, Mexico City and Monterrey that were interconnected via satellite links. Each of these nodes uses an X.25 switch from BT North America to provide VAN services.

A dedicated satellite link from Grupo SIT's Mexico City node to BT North America's San Jose network hub links BT North America's global data net with Grupo SIT's network.

Previously, BT North America only provided service to Mexico via an X.75 gateway connection with Telefonos de Mexico, S.A. de C.V.'s domestic VAN. This gateway limited the kinds of services that BT North America could offer to users in Mexico.

By linking with Grupo SIT, which uses the same equipment as BT North America, the latter company can offer users in Mexico every service available to users in the U.S.

Additionally, BT North America will announce that it has opened new Canadian nodes in Dundas, Ontario and Halifax, Nova Scotia; new French nodes in Marseilles and Toulouse; and new nodes in Bremen, Germany; Turin, Italy; Auckland, New Zealand; and Neuchatel, Switzerland.



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FTS 2000 compliance ordered by GSA

continued from page 4

tor utilities, must suspend any expansion of telecommunications services not provided under FTS 2000.

The GSA gave the utilities 30 days to present a hardship case that might change its decision.

However, the order noted that discussions intitiated with the Department of Energy on the matter last April had failed to sway the GSA from migrating the utilities to FTS 2000.

The GSA order shocked at least one utility official.

"We've had stability all these years," said Roger Seifert, deputy assistant for Bonneville Power. But the GSA order threatens to disrupt plans the utilities have mapped out years in advance, he said.

Facilities in limbo

The order to cease facilities expansion throws Bonneville Power's construction of power generating facilities in California into limbo, Seifert said.

"We're spending $40 million on a new system in California, and we can't hook up new [telecommunications] facilities," Seifert said.

Seifert said private microwave is the most reliable — and perhaps the only economical — source of communications in remote areas where dams and power lines are often located.

Bonneville Power, based in Portland, Ore., operates an extensive microwave network running throughout the Northwest, encompassing Idaho, Montana, Oregon and Washington as well as parts of California. The microwave network, operating at 1,718 to 1,850 MHz, carries data and some voice traffic. It allows Bonneville Power to operate and control power lines, nuclear plants and federal dams along the Columbia River.

The GSA order would require the five electric utilities to vacate their extensive microwave facilities in lieu of FTS 2000 long-distance services. The costly move would inevitably impact ratepayers in the region, Seifert said.

The exemption granted by GSA in November 1988 determined that the five had "unique mission needs" in the job of "control, monitoring, operation and maintenance of the power transmission systems to ensure safe, reliable and efficient operation during ongoing and emergency power system activities."

In his letter, McDonough failed to explain why the GSA has altered its decision on the five utilities. He did not return phone calls from *Network World* by press time.

Seifert doubted that a transition to FTS 2000 could be accomplished in only four months due to the complex communications reliability and redundancy requirements of nuclear power facilities. ☐

HP to introduce net mgmt. product

continued from page 4

Manager, which was announced last week.

The Network Node Manager is a Unix-based network management application that collects SNMP statistics from devices supporting SNMP Management Information Base (MIB) I and II, as well as statistics from devices supporting vendor-specific MIB extensions that have been published. MIBs define what can be managed within SNMP.

Although the Node Manager runs under the Internetwork Manager, it is available separately and has its own merits, according to the company. The Node Manager automatically maps and continuously monitors the network and system resources across the TCP/IP network.

The Node Manager gives the administrator a single, graphical view of the network and eliminates the need for continuous polling to get statistics, which also must be mapped and analyzed. The previous version also included mapping capabilities, but the new release has features such as dynamic data collection and user-defined thresholds.

Dynamic data collection lets the user gather historical information for almost any MIB variable regarding every SNMP device. Previously, administrators could plot current network traffic and errors but could not log those statistics into a report. The thresholds let administrators set limits to the MIB statistics so they can be alerted if errors exceed a certain number.

Rohm & Haas Co., a chemical company in Philadelphia, is currently using the Network Node Manager Version 1.0 to manage Apple Computer, Inc. AppleTalk, Digital Equipment Corp. DECnet and TCP/IP networks in three locations, said John Danos, a network engineer at Rohm & Haas.

According to Danos, the company is pleased with the first release and plans to implement the second as soon as it becomes available. "It's certainly a good product; we use it almost every day," Danos said. "The [Node Manager] lets me instantly see the state of the network and run quick tests. It gives me a good graphical representation of the entire network."

Danos said that before this product, the company had devices that could trap and analyze data on a local-area network or poll different hosts to see if they were available.

HP OpenView Interconnect Manager will be available for $17,000 on July 1. HP OpenView Network Node Manager Release 2.0 will be available separately this month at a price of $15,000. ☐

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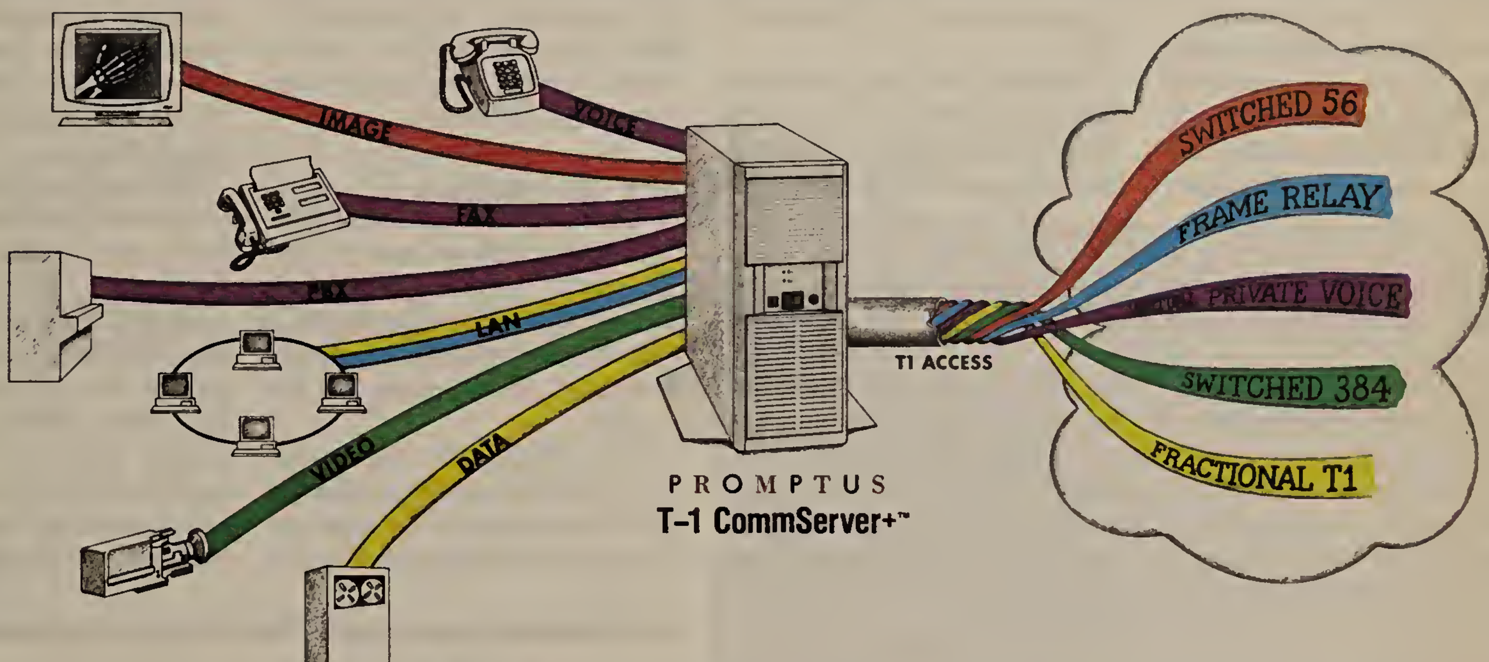

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PROMPTUS

New DEC, HP routers ready

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duce software upgrades that transform existing low-end DECrouter 100s and mid-range DECrouter 2000s from DECnet-only to multiprotocol routers supporting Integrated IS-IS. The software will be available immediately.

Analysts and users said they are glad to see DEC backing the multiprotocol router concept after it spent both considerable time and money trying to convince users that OSI would be the backbone technology of the future.

"While OSI may be the protocol of the future, TCP/IP is the multivendor protocol of the present, and DEC has to play in both fields," said Philip Demar, network analyst at Fermi National Accelerator Laboratory, a physics research lab in Batavia, Ill.

But the inability to route packets wrapped in other widely used protocols such Novell, Inc.'s Internetwork Packet Exchange (IPX) and Apple Computer, Inc.'s AppleTalk could limit the appeal of DEC's new products, especially when other vendors such as Cisco Systems, Inc. and Wellfleet Communications, Inc. perform this function, said Nick Lippis, a principal at Northeast Consulting Resources, Inc. in Boston.

"DEC is finally getting into the multiprotocol routing business," he said. "But basically, we're going to see the potential for delivering too little, too late."

The NIS 600 chassis, which is based on the Institute of Electrical and Electronics Engineers, Inc.'s high-speed backplane Futurebus II, has seven slots and will accommodate multiport Ethernet, 64K bit/sec and T-1 interface boards.

Each board in the NIS 600 will have its own processor that works in conjunction with a system CPU. Analysts said DEC claims that this multiprocessor architecture enables the NIS 600 to route a total of 120K variable length OSI, TCP/IP or DECnet packets per second.

But analysts are not convinced because the product has not been field-tested.

"All DEC's estimates are just rough calculations based upon what a box of this architecture should be able to do," said Frank Dzubeck, president of Communications Network Architects, Inc., a consulting firm in Washington, D.C.

Analysts did agree, however, that the NIS 600 will be able to route more packets per second than existing DEC routers. "Even if it can only achieve 20% of that [120K packet/sec], that speed is still impressive," said Howard Niden, director of Price Waterhouse's Great Lakes VAX consulting service in Chicago.

Low-end upgrades

DEC will also announce DEC WAN Router 100 software for the DECrouter 100 and DEC WAN Router 500 software for the DECrouter 2000, packages that add Integrated IS-IS support to the routers.

The DECrouter 100 costs $5,500 and has a single Ethernet port and a trunk side interface supporting speeds up to 64K bit/sec. The DECrouter 2000 has a single Ethernet and four 64K bit/sec, three 256K bit/sec, two 384K bit/sec or one T-1 wide-area network interface. It costs $12,600; the software upgrade costs $100.

> "DEC is finally getting into the multiprotocol routing business, but basically, we're going to see the potential for delivering too little, too late."
>
> ▲▲▲

"To have DEC start showing up with multiprotocol routers is exciting enough," said Leslie Maltz, director of computing and communications resources at the Stevens Institute of Technology in Hoboken, N.J. "But the fact that DEC is protecting our investments with $100 software upgrades is very exciting."

The NIS 600, DECrouter 100 and DECrouter 2000 all support the Spanning Tree Algorithm, which enables them to bridge traffic they cannot route. Each router can be controlled from network management systems supporting the Simple Network Management Protocol, including DEC's DEC Management Control Center Director.

HP said it will use the ICA conference to unveil a low-end router that runs software supporting Wellfleet's proprietary routing protocol, the Internet Engineering Task Force's Routing Information Protocol and the emerging Open Shortest Path First routing protocol. The $9,000 product is the first fruit of a technology-sharing agreement HP and Wellfleet signed last year.

HP's router will forward AppleTalk at 7.5K packet/sec, DECnet Phase IV at 6.6K packet/sec, IPX at 6.2K packet/sec and TCP/IP at 9K packet/sec. The rate for routing Xerox Corp.'s Xerox Network Systems and X.25 was unavailable. The router also supports the Spanning Tree Algorithm to bridge protocols it cannot route.

The product is the size of a modem and comes with two Ethernet ports and two wide-area interfaces supporting speeds of up to 2.048M bit/sec, the European T-1 rate. The router is managed from HP's OpenView integrated management system running the new Internetwork Manager application. ☐

DEC announces bridges

ANAHEIM, Calif. — Besides routers, Digital Equipment Corp. is expected to use the International Communications Association 44th Annual Conference and Exposition here to announce Ethernet-to-Fiber Distributed Data Interface bridges and new Open Systems Interconnection software products.

Among the products to be unveiled is the DECbridge 500, which will link an Ethernet to an FDDI backbone and cost $25,000 to $41,000, depending upon configuration. Another is the DECbridge 600, which has three Ethernet ports and a single FDDI port and costs between $21,000 to $45,000. They both will be available in August.

In addition, DEC will unveil an FDDI adapter board to enable DECstation 5000 workstations to use shielded twisted-pair or thin-wire coaxial cable to connect to a new board for the DECconcentrator 500 FDDI concentrator. The DECstation 5000 adapter will cost $4,500, while a six port shielded twisted-pair or thin-wire coaxial cable board for the DECconcentrator 500 will be priced at $3,000.

DEC will also introduce a product code named Advanced-Networks for Ultrix, a package that will support all the features DEC promised to deliver in DECnet Phase V for Ultrix.

While a full fledged OSI package for VMS is not due out until next year, DEC will unveil at the show DECnet VAX Version 5.4, enabling VAXes on DECnet Phase IV nets to act as End System nodes in OSI nets.

— Jim Brown

Net mgmt. systems debut

BIRMINGHAM, England — British Telecommunications PLC and Digital Equipment Corp. this week will demonstrate versions of their net management systems that support an emerging specification that enables the systems to exchange data.

At the Networks '91 exhibition here, British Telecom and DEC will display versions of their respective integrated net management systems supporting the Open Systems Interconnection/Network Management Forum's Release 1 specifications. Those specifications are meant to enable network management systems from different vendors to exchange data using common commands.

British Telecom will use the show to display a Release 1-conformant version of its Concert Integrated Management System (IMS) exchanging alerts with the DEC Management Control Center (DECmcc) Director.

The demonstration will feature the Concert IMS managing a British Telecom packet network and receiving alerts from a DECnet via the DECmcc Director, according to Keith Willetts, chairman of the OSI/NM Forum and product line manager for network management at British Telecom. Users visiting the British Telecom booth will see the company's view of what's occurring on both networks.

"It will be quite good to see a major telecom player and a major computer player making this thing real as opposed to all the talk that's been going around," Willetts said.

The Concert IMS, which will be available in the U.K. later this year and in the U.S. early next year, has passed the OSI/NM Forum's conformance test, establishing it as "OSI-conformant up to and including [the Common Management Information Protocol]," he said.

In the first multivendor network management demonstration using the OSI/NM Forum Release 1 specifications at the Communication Networks '91 conference earlier this year, British Telecom showed its Concert IMS managing Timeplex, Inc. and Ungermann-Bass, Inc. network gear.

In that demo, the Concert IMS linked to an Ungermann-Bass NetDirector net management system for which British Telecom "built both ends of the Release 1 interface," Willetts said. A significant difference between that demonstration and the Networks '91 display, he said, is that both British Telecom and DEC developed their own Release 1 interfaces.

— Bob Brown

MCI plans int'l switched for '92

continued from page 6

offering the international service in 1990, and US Sprint will roll out its version this month. Analysts said MCI's delay may be due in part to contract negotiation problems with foreign carriers.

"The problem is not at this end, it's at the other end," said Jeff Held, an analyst with the Network Strategies practice of Ernst & Young, a communications consulting firm in Vienna, Va. "Foreign PTTs really don't like having multiple carriers."

Because AT&T is already the entrenched international carrier, it is often difficult for other companies to negotiate contracts with foreign countries for international traffic, Held said.

AT&T offers the service in 11 countries and plans to announce service to at least one more country at the International Communications Association's conference in Anaheim, Calif., this week. Prices for the service vary according to region.

US Sprint's switched 64 bit/sec service is offered as part of its Global Virtual Private Network service between Hong Kong, the U.S. and the U.K. It plans to add service to Canada and the Netherlands in the third quarter. ☐

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In a world
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something unique
has just arrived...

Amex drafts CCS7 plan

continued from page 1

ly met with its 800 service providers — AT&T and US Sprint Communications Co. — to discuss linking an on-site signal control point here with the carriers' CCS7 signaling nets.

The two carriers have explained to American Express TRS how they'll accomplish the task, but Hoss declined to divulge the details of those plans.

"We've been pushing the carriers for a few years now," Hoss said. "But I'm convinced that we are not far off on this and [the Big Three] will eventually roll out CCS7 interconnection services for any user."

Hoss said American Express TRS wants to begin testing a CCS7 link with one carrier as part of a beta field trial involving a limited number of call center sites early next year. If the trial goes well, the company plans to test CCS7 links with other carriers shortly thereafter. American Express TRS hopes to have CCS7 connections in place to handle call routing for all its call centers by 1993, Hoss said.

The process of routing incoming calls would change dramatically under American Express TRS' plans.

Under the new scheme, when a merchant or card member dials a toll-free American Express number, the switch at the originating end would hold the call while checking an 800 data base at a carrier signal control point (SCP) to determine the call's destination. That SCP would then pass the signaling information over an X.25 link to the American Express SCP.

In the user's network, call centers would continuously send status messages over dedicated lines to the on-site SCP. For example, when a site was swamped with calls, it would inform the SCP. The SCP would then decide where to direct the traffic in order to reach free agents.

Next, the SCP sends the telephone number of that site to the carrier's SCP, which instructs the originating switch to route the calls. The carrier network then establishes a route through the network and releases the call to its destination.

Currently, American Express TRS faces challenges common to many large ACD network operators. Incoming calls are typically routed to the nearest call center, and a surge in calls can swamp a single center for hours.

> "This system would enable us to directly calls to the nearest free site," Hoss said.

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Because CCS7 links to carrier signaling networks would enable American Express TRS to dynamically route calls to the first available agent at any call center, the company could avoid deluging some centers while agents at others sit idle.

"If traffic peaked at one center due to localized sales activity or a problem in the network, we'd want to handle overflow automatically," Hoss said. "This system would enable us to direct calls to the nearest free site."

The enhanced ACD network would make traffic engineering more efficient and less expensive. "Rather than do traffic engineering on a per-center basis, we could do it based on all centers and all agents in the nationwide pool," he added.

The largest benefit American Express TRS clients would receive from this system is vastly improved customer service.

"When we've had traffic congestion at a particular [site] — maybe a major department store has had a sale and generated lots of card usage — service establishments have had to wait in queue," Hoss said. "And that's an inconvenience."

Net/Master gives better support

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hanced with this release to support LU 6.2, an IBM protocol for communicating between applications.

Vecchio said LU 6.2 will make it easier for users and Systems Center to create links between separate NCL routines running under Net/Master.

For example, automation often requires a number of NCL applications — which can be running on the same or different hosts — that "listen" for specific network problems and report them to a separate application.

Today, such communications are asynchronous and the communications function must be built into the application. LU 6.2 will allow a full bidirectional link between applications.

In addition, third-party vendors could use LU 6.2 to ship management data from their equipment or net management applications to Net/Master.

Systems Center has announced agreements to work with vendors such as Digital Equipment Corp. and Tandem Computers, Inc. on various net management products. While Vecchio stopped short of saying LU 6.2 would be the vehicle to let Net/Master exchange management data with applications on those vendors' machines, he said discussions are under way on that topic with a number of vendors.

Support for SQL will let Net/Master tap into more data sources than before, Vecchio said. Net/Master's first implementation of SQL will support requests to IBM's DB2 data base to access information such as inventory data.

For example, customers could use NCL to write an application that would trigger an SQL search for configuration data on network devices in which Net/Master detects a problem, Vecchio said.

To help Net/Master understand data presented to it, Systems Center also unveiled Mapped Data Services, a facility that simplifies the task of mapping management data into formats Net/Master can understand.

Today, routines have to be written in NCL to break apart alert messages, such as those presented in IBM's Network Management Vector Transport (NMVT) format, and extract the relevant information from the various fields within the message. That requires programmers to be intimately familiar with the construction of numerous alert message formats, according to Vecchio.

With the new facility, NMVT and other message formats would be broken up according to the map provided, so the programmer does not have to be concerned with that task.

The company plans to have a different map for each major net management data format, including the Simple Network Management Protocol (SNMP), the OSI Common Management Information Protocol (CMIP) and IBM's NMVT.

Support for SNA management structures will ship with Net/Master 2.2. Vecchio declined to say when support for CMIP and SNMP would ship, although he said they were high on the priority list.

Net/Master 2.2 will be available in the third quarter. Pricing ranges from $19,000 to $66,000 for MVS hosts and from $11,000 to $51,000 for VM.

Brokerage firm counts on voice

continued from page 2

Shearson Lehman here.

EJV's government bond brokerage net began running on Wednesday with more than 100 traders at nearly 40 brokerage firms on-line, according to company officials.

Traders execute deals on the net via Intel Corp. 80386-based microcomputers supplied by EJV that are linked via 56K bit/sec dedicated circuits to EJV's T-1 backbone network, which routes traffic to a data center in Jersey City, N.J.

Each microcomputer contains a voice recognition card from Edison, N.J.-based Verbex Voice Systems, Inc. Traders use a telephone handset attached to the Verbex card to speak trading commands into the microcomputer. The Verbex card converts spoken words into keystrokes that move the cursor on the trader's screen.

For example, if a trader wanted to respond to an offer to sell bonds listed on the eighth line of his computer screen, he could say, "Line No. 8, buy 10." The cursor would then move to that line and highlight what the trader wants to buy.

If the trader says, "confirm," the trade order is transmitted over the wide-area network to minicomputers in the EJV data center that execute trades. Confirmations are sent back to printers next to traders.

The voice recognition system is supposed to work 95% of the time. If it fails, traders can use their keyboards to execute trades. According to Richard MacWilliams, president of EJV Brokerage, voice recognition is crucial to his firm's competitive success in the tough market for brokering government bond trades.

Traditionally, government bond deals have been brokered by telephone. Traders call brokers who set up deals; traders remain anonymous to one another.

However, EJV will rely on its computers to match buyers and sellers. That reduces transaction costs and enables EJV to charge commissions averaging 50% less than other brokers. According to MacWilliams, voice recognition is critical to convincing traders to accept the automation.

"To the extent that we can reduce the amount of change, we think people will be more inclined to use us," MacWilliams said.

Allan Grody, president of Financial Intergroup Holdings, Inc., a financial services technology consultancy here, said that if EJV's voice recognition capability works well, it will likely spur acceptance of the technology throughout the financial services industry.

Voice recognition systems have been tested at other firms, including the Chicago Board of Trade, Chicago Mercantile Exchange, New York Stock Exchange, Quotron Systems, Inc., Reuters Holdings, PLC, Salomon Brothers, Shearson Lehman and Telerate, Inc. These tests have been of small implementations, with the exception of Shearson Lehman.

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